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THE NEUROSURGICAL PROBLEMS OF WARFARE

A Collective Review of the Literature Since 1935

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IN view of the present rapidly changing status of the worldwide conflict, a comprehensive review—even a critical review—of the medical problems which are constantly arising and of the means with which such problems are to be met, seems to be timely and practical. It apparently requires a war of major proportions to bring home our deficiencies in handling illness and injury under stress, or of practicing good medicine on masses of urgent patients. It is admitted that under the strain, both physical and financial, of intense warfare we may not expect the development of altogether sound methods; such developments should come in time of peace. However, it takes only the experience of a surgeon whose activity has bridged the period from the last world war to that of the present one, to verify the statement that this war finds us wanting in many fundamental ways, and finds us embarrassingly little in advance of many of our ideals and processes which were in vogue twenty-five years ago.

This present review, skimming the pertinent literature since 1935, reveals the fact that so far as the practice of neurosurgery in warfare is concerned, little of value came out of the Spanish civil war. Since 1939, when casualties in large numbers began to appear in Britain, Scandinavia, France, and Germany, there has been an ever-increasing number of reports of current methods of meeting the challenge presented by the man with a serious injury of the nervous system. What medical literature there is to be had concerning the Spanish war is concerned mainly with the treatment of fresh wounds, with stress of the "dovery-little, non-suture, application-of-cast" principle. It is as if the present war, with its sudden and savage intensity, distracted the attention and efforts of those who might have offered something fresh and helpful from their experiences in that civil conflict. The average American doctor, until recently quite removed from any practical interest in the second World War, most likely has not the remotest idea of the difficulties under which medical practice has had to adapt itself to the new type of warfare, or of all the new problems which have been brought into being. Undoubtedly there has been little time for speculation, experimentation, or unhurried investigation; rather, the medical forces have had to muster what facilities they had and make the best of the situation. The point made is that their facilities and their approach are, for most practical purposes, about what they were at the termination of World War I in 1918. It is a criticism of peacetime, not wartime, efforts.

This review makes no pretense at quoting the several hundred articles which were investigated in order to arrive at this brief summary. Direct reference is made only to those authors who had something new, useful, or emphatic to state. Until the present time medical authors in the warring nations have frantically stated what was already known, they have hopefully quoted old authorities, and they have, in rather apparent despair, repeated themselves time and again, as if to bolster their own convictions until difficulties clear sufficiently for sound principles to stand upon their own merits. At this time, late in 1941, our entire thought on the medical problems of warfare is undergoing constant stress, strain, and change. Not until some time after all noise and smoke have settled away may we expect clarification of many current perplexities, if we are to

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judge by the experience of medical and surgical practice following the war of 1914 to 1918.

A review of the neurosurgical problems of warfare covers, quite naturally, the subjects of (1) craniocerebral injuries, their immediate care and delayed complications; (2) injuries of the spinal cord; and (3) peripheral nerve injuries. The unfortunate fact concerning many injuries of warfare is that the rehabilitation of the individual, if he survives the acute stage of his wounds, is frequently so incomplete that the patient remains a burden to himself and the society in which he must spend the remainder of his days.

CRANIOCEREBRAL INJURIES

In an attempt to determine the exact course of events in penetrating wounds of the brain, Pilcher (6) studied 54 dogs, into the heads of which unsterile foreign bodies (nails) were inserted to varying depths and for varying lengths of time. He found that foreign bodies penetrating the ventricle and still protruding through the skin invariably produced a rapidly spreading and fatal infection of the meninges, brain, and ependymal lining of the ventricles, but if a foreign body, so located, was removed within twelve hours after its insertion the incidence of fatal infection was greatly reduced. Furthermore, failure of the nail to reach the ventricle greatly reduced the likelihood of death from a fulminating infection. A conclusion of great practical importance is that the unsterile nails, deeply imbedded but not communicating with either the skin or the ventricle, do not cause fatal infections unless the ventricle had at some time been penetrated. When a superficial cerebral infection develops about a foreign body, the removal of that object and adequate drainage of the local site greatly reduces the mortality rate. Pilcher therefore arrived at several basic conclusions, now being put into practice in the present war. His experiments show that a foreign body communicating with the skin, subarachnoid spaces, or the ventricle should be removed as early as possible, but if the object is located deep within cerebral tissue and does not communicate with the ventricle or the outside, it is usually best to leave it in place unless local destructive symptoms develop. His article, incidentally, contains a remarkably useful set of references to the literature of craniocerebral wounds previous to 1936.

Gosset, quoting Beguoin (45), points out that in many instances craniocerebral injuries are still being treated as they were in the first World War, or even not as well (35). As an example of what he states to be a frequent occurrence, he cites a man who, forty days after his original injury, finally arrived at a permanent neurosurgical center, having been *trephined in an emergency ambulance at the front.* When he at last was seen in the hospital he had an uncontrollable infection and died. Such a case, compared with that of the man who is transported far back of the lines immediately and who receives his surgical care under good hospital conditions, indicates clearly enough the fact that present-day surgeons should know better than to attempt a cranial operation any place except in a well equipped operating room. Vogeler (63), whose experience is based on modern "blitz" warfare, agrees with Gosset entirely, stressing the point that craniocerebral wounds of war are in a class by themselves, and are of a gravity apart from other types of war wounds. Infection stalks continuously as the great menace in war wounds of the head, and not only may this infection spell the early death of the patient, but it will, if the patient survives, very likely result later in epilepsy. War wounds alone, healing cleanly, predispose all too frequently to epilepsy, and infection only assures the likelihood of this late complication. Vogeler sees great need of *early* care, with careful cleansing and débridement of the wound, but his strong plea is for making the *first* surgery the *definitive* and *final* surgery, followed by bed rest for an adequately long period of time.

Geoffrey Jefferson is one of Britain's senior neurological surgeons and a man of much experience and reliable judgment. At the beginning of Europe's present war he stated (24), "Wartime surgery is largely the management of potentially or actually infected wounds or of open bone injuries . . . . . Wounds of the head do not mix well with other casualties in the rota for operation. The need for pre-operative study and the rather more fastidious technique necessary in their treatment do not harmonize well with the tempo of that for miscellaneous injuries." Jefferson is convinced that neurosurgical procedures in wartime are of necessity slow and that speed should not be a factor if the best results are to be hoped for. He believes that if cranial surgery is to be done at all on an injured soldier or civilian then it must be done just as well as possible, for nothing less will do. Furthermore, he is strongly of the opinion that neurosurgical operations should be performed by men trained in neurosurgery, not only for a better immediate result but also for less residual disability. The neurological symptoms and the history, together with the x-ray findings, must be known by the operating surgeon himself. "No greater mistake can be made than to think of a gunshot wound of the head as a pure exercise in

operative technique without reference to neurological signs." A surgeon seeing a patient for the first time on the operating table cannot possibly know how far to proceed or exactly what to do—whether to open and search within the dura, where deep injury may be suspected—or what complications may be expected to arise during the operation, for the local appearance of the wound when draped for operation will actually tell the operator very little. Jefferson believes that indriven bone fragments are an especially dangerous source of infection and that they should always be removed. He frequently found them to be infected with the bacillus welchii. Whenever operation is to be done, it should be done at the earliest possible time when proper facilities are at hand. X-ray studies must be made to locate bone or metal fragments, and if none are found and the dura mater is not opened, the prognosis is always immediately better, regardless of what the injury may amount to otherwise. The head should be completely shaved, and a local infiltration of 1 per cent novocaine solution, after proper scalp cleansing, is the best of all anesthetics. Jefferson prefers the triradiate incision. "Its advantages are that an adequate exposure can always be obtained, the minimum of gap occurs if the wound breaks down, and drainage tubes can conveniently be placed . . Semicircular skin flaps such as are made in neurosurgery for the turning of osteoplastic flaps are best avoided." This is contrary to the opinion of certain French surgeons, among whom is De Martel (19, 20). Depressed bone fragments are to be raised, bone fragments are to be removed if they overlie deeper injury, and the dura is to be inspected and closed without drainage if it has been opened and torn. Linear fractures usually need no special treatment unless an underlying hematoma is suspected, in which event the dura mater and subarachnoid space may be inspected through a burr hole in the bone. Should the dura, under such circumstances, appear blue or a purplish green, it must be incised, following which the clot and macerated brain may be extruded. The Cushing method of catheter suction and gentle saline irrigation of the deeper cerebral injury is advocated, with gentle forceps débridement of the tract, the devitalized brain and deep clots being allowed to float out on the gentle irrigating stream of warm saline solution. As a principle, Jefferson states that missiles are best removed, but only when that can be done without further injury to the brain, especially when probing would lead to a spread of infection or the likelihood of later epilepsy. Missiles lying deeper than 1 in. under the cortex can best be removed by an electromagnet carrying from 4 to 6 volts, since modern missiles usually are so small that a magnet of such drawing power will suffice. When venous sinuses have been torn, the bone must be rongeured away from the opening and the rent closed by suture, if that is possible. In such tears, thin "hammered" muscle stamps are found to be particularly effective. All wounds must be closed with care, and without tension. The use of catgut is generally followed by difficulty. It is perhaps safest to drain most of the wounds for two or three days, by means of fine rubber strips; but even under the best of circumstances meningitis and cerebral fungus may develop, this being true especially if the ventricles have been opened. The use of chemotherapy and repeated lumbar punctures is advocated when an infection develops within the cerebrospinal-fluid spaces. Jefferson would practice just as good surgery in wartime as he does in peacetime. In his own words, "It is a mistake to assume that the urgency of the operation is so great that all surgical ideals should be discarded."

Money (54) holds to the principles laid down by Jefferson, and, before him, by Cushing. He states, "Wartime surgery is largely concerned with the care of infected wounds and compound fractures, so that the general principles applicable to these classes of surgery always hold good . . . . The ideal method of dealing with these casualties (head injuries) is to segregate them in special hospitals, or at any rate to allot them to special teams with neurosurgical experience, as early as possible. Such a team would consist of a surgeon, a first assistant, and an anesthetist—a radiographer or x-ray technician, an instrument attendant, a theater attendant, and an orderly or male nurse." He points out that such ideals, however, are rarely attained. Air-raid casualties among the civilian populace make it necessary that every physician know the essentials of early care of head injuries, and when the physician knows the history of the patient and is able to follow the neurological changes, decisions for or against surgical care may be made with much more accuracy. Money advises early operation when it is to be done at all, and he advocates the removal of an indriven missile when that is practicable without further brain damage, but he emphasizes the fact that by no means is a fragment of metal, left in place, always the focus of an abscess or of epileptiform attacks. Stuppler (60) also favors conservative treatment of the imbedded metallic fragment.

That early operation with primary suture may save the life of the patient with a fresh injury of the brain is a fact recognized by all European surgeons. Hart (22), drawing upon his experi-

ences in the Spanish war, states, "The results when the ventricles have not been penetrated are so excellent with early operation and primary suture without drainage that no case should ever be left unoperated over 24 hours. The wound should always be sutured and the patient given a period of 10 days at least, 20 days if possible, of undisturbed postoperative rest. Without such treatment the mortality from such wounds, when the dura has been penetrated, approaches 100 per cent." Peiper (28) has stressed these same points, and he states that craniocerebral injuries constitute the major surgical problem of warfare, an opinion shared by many other authors as well (19, 20, 24, 32, 47, 59). He describes a small packet in use by some of the German troops (4), to be used for the immediate dressing of an open wound on the field of battle. Such a sterile dressing is useful in the control of hemorrhage and the avoidance of further wound contamination until the wounded man can be given first aid behind the lines. Piquet, Dereux, and Becuwe (73) agree with Hart that if operation is to be done at all, it must be done early, especially if the wound is potentially infected and if a foreign body is to be removed. To remove a bullet or shell fragment after a long delay of several hours or even days is the same as operating through an infected field or through an unwalled-off abscess. Furthermore, they state, if active infection is imminent, operative removal of an infected foreign body will never help matters. The concensus of opinion is, then, in a large number of reports (19, 20, 29, 30, 32, 33, 37, 55, 59, 61, 62, 64), that early operation, complete and careful wound excision and débridement, and a sufficient period of rest after operation are matters of primary importance. There is great variance of opinion as to whether potentially infected but surgically closed cranial wounds should be drained. The matter of the imbedded foreign body has received much attention, and most surgeons believe that it is best removed if this can be done without adding further insult to the injury, for if further damage to the brain will result it is best to leave the object alone. Landau (52) has devised an ingenious method for the exact localization of indriven bone fragments and metallic missiles by means of projected lines along predetermined co-ordinates on the "ideal" dry skull, the technique being carried out by roentgenography. By such a method the exact distance of the object below the cortex can be determined, and when the point on the cortex to which it is nearest located has been determined, it may be removed through that particular area without any deeper exploration than necessary. Ehrenpreis (39) has developed a special cannulated, spoon-shaped intracerebral-bullet extractor, to be used in those cases in which such a foreign body is to be removed, the merit of the instrument lying in the minimal amount of cerebral damage which its use causes.

In the present type of warfare, "total war," the civilian population comes in for its full share of casualties, and of these a large number are craniocerebral injuries. Jackson (48) believes that the reason for this is, first, the head is uppermost and is almost always inadequately protected, and, second, especially in air raids and large explosions, falling objects strike the head first. Agreeing with the advice of most of the other surgeons dealing with these injuries, he believes that no head injury should have to wait more than from eight to ten hours for operation, and that when surgery is done it must be well done or not done at all. He has no particular faith in ordinary antiseptics, although he favors the oral use of the sulfonamides and believes their local use to be of value in craniocerebral injuries. The more common complications of craniocerebral injuries, among soldiers and civilians alike, are hemorrhage, shock, cerebral edema, sepsis (cellulitis of the scalp, osteomyelitis), meningitis, brain abscess, epilepsy, and arteriovenous fistula. Ferey (40) was especially concerned with the complication of cerebral edema, either before or after operation. He reported 11 cases of closed fractures of the head, first seen and examined in the hospital from seven to twenty hours after the injury. All of the patients were comatose. Six showed bloody cerebrospinal fluid. Some had no localizing signs at all, although definite fractures were proved in all by means of x-rays. Monoplegia or hemiplegia was temporarily present in 4 cases, but cleared up entirely as soon as signs of increased intracranial pressure abated and the general condition of the patient improved. The treatment consisted of the administration of hypertonic magnesium sulfate, strychnine, lumbar taps, and serum intravenously for the fluid intake. Rest was enforced and hospitalization lasted from twenty to thirty days. Ferey decries the use of meddlesome trepanation and of decompression by surgical means. He especially emphasizes the harm that surgery may do to an extremely ill patient who, with judicious conservative care, may show improvement in the face of great odds. To him, surgery is something to be held in reserve but to be used without hesitancy when its indications have been carefully thought out. He has used repeated lumbar punctures, performed slowly and carefully, with a good deal of success in helping to keep down the intracranial pressure in his nonoperative cases.

Mitchener and Cowell (27) likewise point out the high incidence of head injuries in the present war due to the new factor of air raids. Severe concussions are especially frequent, and such injuries are apparently more severe than the usual concussion seen in civilian practice because of the devastating air-blast effect. The "blast-effect" is actually a syndrome in itself, and it may be accompanied by gross internal hemorrhage of the brain without skull fracture. Pial vessels and venous sinuses may be torn and large localized subdural clots may form without any visible sign of injury to the scalp or skull. *Extradural* clots, on the contrary, are usually accompanied by some sign of injury to the cranium (9). These authors were concerned with the meticulous early care of the wound, and with the ingenious devices which may sometimes be necessary in closing the wound when a mass of scalp and muscle has been torn away. They are practical, if somewhat pessimistic, along with De Martel (19, 70), in their outlook upon perforating wounds of the skull and brain. They stated that because of the severe disintegration of the brain resulting from the force of these missiles, the prognosis in these cases is very grave, most of them proving fatal, and that in a rush of wounded no undue time should be wasted in operating upon such patients at the expense of delay to other patients with a better prognosis. They believe that a bullet may course around a segment of the skull and not cause much damage in its path, yet the impact of its striking may cause a severe concussion. In such injuries, clot formation is frequent, and if the patient is unconscious it may well be due as much to the clot as to the effect of the concussion. All foreign bodies, they believe, should be removed when such removal requires only gentle search. "No prolonged search must be made for deeply buried or distant fragments, which often cause no trouble at all, or, at the worst, localized sepsis (brain abscess) and can be removed later, if necessary, after radiography. Moreover, search both damages the brain unnecessarily and spreads sepsis." Roentgenography is desirable if facilities are at hand and there is no rush of wounded, but in a rush of casualties its use may mean the loss of much valuable time, and operation must be done early if life is to be saved and sepsis is to be avoided. On some of these points, it seems, they are not quite in agreement with the unyielding surgical principles and disregard for time upheld by Jefferson.

Horrax has stated (47) that the improved technical aids available since the first World War should make for better neurosurgery in the present conflict. He suggests that as a prophylactic measure all soldiers should go into action with closely cropped hair, and that tetanus toxoid should be used freely. After injury, the entire head should be shaved, a complete neurological examination made, and stereoscopic x-ray pictures should be made of the head when appropriate apparatus is at hand. The surgical approach recommended by Horrax is the same as that which was developed by Cushing in the last war. In gutter or penetrating wounds, excision and painstaking débridement should be done down through the scalp and bone, and the injured bone should be removed *en bloc*. The *en bloc* principle has been strongly decried by many as causing unnecessary loss of bone, but it is upheld by most surgeons practicing the general technique of Cushing, and its value in uncovering large tears in the venous sinuses has been emphasized by Newton (56). Radial incisions of the scalp then allow retraction far enough to inspect the skull well beyond the site of injury. Ordinarily the dura mater is not to be excised, but carefully débrided. All pulped brain, indriven bone, clothing, hair, dirt, and metallic fragments should be removed by means of gentle suction along the wound tract in the brain. Sometimes the patient may be asked to cough or strain and thereby deep-lying clots and soft brain will be extruded through the torn dura. The electromagnet, an efficient suction apparatus, and a modern electrocoagulating apparatus are devices which not only speed up the operation but also guarantee a better prognosis in the patient who survives his acute illness.

Along with many other current authors, Cairns (69) points out that there are some striking differences in gunshot wounds of the head in battle from the head injuries of civil life. He noted that in the injuries of war, blunt blows are less often attended by the syndrome of concussion, and that in both dural-penetrating and nonpenetrating head injuries, focal neurological symptoms are more common than in blunt injuries. "These (focal) symptoms show a strong tendency to spontaneous recovery and this fact should be taken into account when considering the operative removal of foreign bodies and dead brain tissue from the brain itself. . . . The case for early and thorough treatment of the parts of the wound superficial to the dura is clear enough." Of all single statements of importance found in this review, the following by Cairns is perhaps the one that should be most heeded: "The apparently trivial operation of cleaning and suturing a wound of the scalp is probably the most important neurosurgical operation of war." He believes that scalp wounds can be excised up to three days or

more after the injury, and he recommends the dusting of such wounds with sulfanilamide. In the front lines, where poor or no facilities for operation are at hand, it is better to apply a moist flavine pack with copious bandages than to try to cleanse and suture the wound under bad operative conditions. Under such conditions Toennis (62) emphasizes the value of transporting the wounded men by airplane back to the base hospitals. Cairns recognizes the validity of the principles of removing deep clots and other septic material, but he believes that in the present war, infection and massive clot formation do not develop in a considerable proportion of the patients. The new conditions of this war, chemotherapy, and the smaller, more rapidly travelling missiles may be the reason for this. He, too, recommends the hands-off policy in the treatment of deep brain injury and removal of foreign bodies unless there are absolute indications for deep probing. He sees too much danger in spread of infection and increase of focal signs and of epilepsy as the result of scar tissue from such unwarranted surgical damage.

The matter of cerebral concussion with all the vagaries of acute and delayed unconsciousness, remains unexplained so far as its actual pathology is concerned, though it has been the subject for discussion by many current authors (15, 16, 42, 53, and others). It is frequently seen following air raids on the civilian population, and as Mitchener and Cowell (27) point out, it may occur without any visible evidence of gross injury to the scalp or cranium. The condition frequently results in death, the only rational treatment known being that of rest and guard against cerebral edema, when surgical removal of a subdural clot is not required. Denny-Brown (71) has observed several cases of "delayed collapse" after head injury in service men. He found that collapse, frequent loss of consciousness, and bradycardia might occur at varying intervals after the injury, which might or might not be accompanied by open wounds of the head. In such patients he did not observe the usual signs of increased intracranial pressure, and he believes the sudden collapse after an interval of several hours' activity to be due to medullary contusion and a minimal amount of hemorrhage in the posterior fossa. Garein and Guillaume (42) regard the severer concussions with a feeling of some pessimism, believing that in the patient suffering from a so-called "commotio" after what was apparently a severe contusion of the brain, the prognosis is always doubtful and frequently very poor.

The treatment of cerebral edema following either gunshot wounds of the head, and the subsequent surgical treatment, or concussion without open wounds has been a subject of much debate, even in civilian practice. Temple Fay (2) gave a good résumé of the development and rational of the dehydratory method of treating cerebral edema. This form of therapy was developed on the neurosurgical service of Dr. Charles Frazer, in 1921. At that time it was found that patients kept on a solid, dry diet, and allowed only 20 oz. of fluid in twenty-four hours, promptly regained consciousness following acute cerebral trauma; their headache rapidly disappeared, and no fluid could be obtained by spinal puncture after two or three days. This was explained as being the result of emptying the overfull fluid reservoirs within the cranium which had been compressing the brain; this procedure allowed the circulation of the blood to become normal once more. At that time such patients were kept on a low fluid intake for three months after leaving the hospital. Glucose in hypertonic solution was the agent of choice, and when indicated, early in the case, spinal punctures were sometimes used. Ghetti (44), in treating acute craniocerebral injuries in the Spanish war, used hypertonic solutions with a great deal of success, particularly in reducing cerebral herniation, as a major adjunct to any other surgical care that might be necessary. He believes that the accurate and timely use of either magnesium sulfate or glucose safe-guards the life of the patient in many instances, regardless of any other, more active, treatment which may also be necessary. He used glucose in from 40 to 60 per cent strength, and at no time did he find such concentrations harmful or toxic. In fact, he believes that glucose, in addition to being a dehydrating agent, is a ready source of needed calories for the patient. He believes that when it is properly administered it has a gradual and prolonged effect, and he did not find it prone to cause osmotic fluctuation to such a degree as to favor a return to secondary cerebral edema. Magnesium sulfate in a concentration of 15 per cent, given intravenously, reduces arterial blood pressure and intracranial edema, and has a generally sedative effect on the patient. The judicious use of both dehydrating agents and carefully performed lumbar puncture is, in fact, accepted as a most useful means of combating acute cerebral edema, but a rather different note is sounded by Dorrance and Loudenslager (1). They believe that small doses of morphine and atropine should be started when an increase of blood pressure, pulse rate, and respiratory rate begins, and such sedation was found by them to be safe and useful for the restlessness so frequently seen in acute head trauma.

They do not favor spinal puncture, since the amount of fluid removed seems to be too small to be of any significance. They believe that the manipulation of the patient in performing a spinal puncture is strictly against the rules of rest for such a patient, and that the withdrawal of fluid might result in a herniation of the contents of the posterior cranial fossa into the foramen magnum. They look upon the various dehydrating agents with disfavor, believing that they not only dehydrate the brain but also the body, and that such general dehydration is bad for any patient in a state of shock. There was very little difference in the mortality rates regardless of the type of sedation, or whether sedation alone or dehydrating agents alone were used. These opinions regarding the use of morphine are, of course, in direct contradiction to the views of neurological surgeons.

The frequent occurrence of epilepsy following the craniocerebral injuries of warfare has been a matter of much concern ever since the last war, and, as Schmidt (7) has pointed out, this may be considered one of the major social problems resulting from war, and is a matter of national concern. Obviously, the injury to the brain in some patients will be so great that regardless of their care epilepsy is bound to result. In others, epilepsy has been shown to be the result of unwise surgery, particularly of the surgeon's zeal to extract an indriven missile regardless of the burrowing required. Other causes, too, such as infections (abscess, meningitis, osteomyelitis) have been frequently linked with epilepsy after the acute stage of the injury has passed. Bleck (18) points out the advantages of electrosurgery in the prevention of surgical damage which might result in epilepsy, and certain surgeons at the Montreal Neurological Institute have reported (65) the successful use of "amnioplastin" to cover fresh wounds of the cerebral surfaces. This substance, prepared from the amnion of fresh human placentas, is said to reduce to a minimum the adhesions which invariably form when the cerebral cortex is injured either accidentally or surgically. Ascroft (68) reviewed the case histories of 317 patients, all of them soldiers in the first World War who had received cerebral gunshot wounds. Of these, 107 (34 per cent) were suffering from convulsive seizures four years or more after the war. Thirty-three of the 107 were having major convulsions with a focal onset, frequently with an aura. Many cases of petit mal likewise were of a focal type. It was found by this investigator that attacks were twice as frequent in those cases of cerebral injury in which the dura mater was penetrated, compared to the cases of injury without dural tears. Furthermore, patients from the brains of whom metallic foreign bodies had been removed were much more commonly epileptic than those who had not undergone such surgery at the time of their injury, or even those who still retained their bullet. Reliable data concerning the effects of indriven bone fragments were lacking. Scalp wounds of all kinds were followed by an incidence of 24 per cent—a high figure—probably due to the fact that such scalp injury, when produced by a metallic missile of warfare produces a more severe underlying brain injury than does the usual scalp injury of civilian life. As would be expected, epilepsy was more prevalent in those patients who had had a septic cerebral wound. Ascroft found that although epilepsy is probably more certain to follow direct injury to the sensorimotor cortex than to some area removed from the rolandic zone, yet all in all the exact site of cortical damage did not seem to have such an important bearing on the production of convulsions. Immediate unconsciousness after cerebral gunshot wounds did not influence the subsequent liability to epilepsy. He found that the first seizure may occur within a few hours or as late as twenty years after the original injury, but that usually the onset of the convulsions is sometime during the first two weeks after injury.

The local use of antiseptics on the brain itself has only recently begun to arouse interest, and the recent report by Russell and Falconer (74) concerning their work with many different types of antiseptics on the brains of rabbits is a timely and fundamental communication. They stressed the point that the *isotonicity* of anything brought into contact with the brain is a very important matter. Gross hypotonicity is very destructive, and hypertonic solutions of various kinds cause extensive hemorrhage and necrosis. Any substance used on the brain should not only be isotonic, but also *neutral*. Merthiolate, metaphen, azochloramide, hydrogen peroxide, and several other popular antiseptics were found to cause extensive softening, necrosis, and hemorrhage within the brain. These authors have not yet experimented to any extensive degree with the sulfonamides, but in investigating the local effect of "soluseptasine," one of the more soluble sulfanilamide compounds, they found that it could be buffered to a normal pH and that in a concentration of 3.3 per cent it produced but little inflammation or degeneration of the brain and leptomeninges. They have no data as to the effectiveness of this strength of solution on bacteria in the brain. They also have no data on the intrathecal use of the sulfonamides and they do not recommend their

use in such a manner. Of all the solutions which they had so far used, they found that proflavine sulfate, in a 0.1 per cent isotonic solution buffered to pH 6.2 caused very little more harm than warm normal saline solution.

In fact, it is the matter of infection which makes all war surgery particularly difficult and hazardous, and this is true especially since bacterial invasion of the cerebrospinal fluid spaces is so frequently fatal. Olivecrona (57) reported that he believes this war is no different from any other in the dangers of infection, contrary to some reports, and that infection of the cerebral wound is the greatest single concern of the surgeon. He believes that head injuries should have early and special consideration over other types of injuries, and that such wounded should be given preference in transportation from the combat lines back to the hospitals. He, like Jefferson, has had sufficient experience to know that nothing short of the best surgical care and the application of only sound surgical principles to such critically ill men must be the rule. Using Cushing's classification of craniocerebral injuries, he found the following mortality in war wounds:

1. Scalp wounds only (no direct injury to the bone or brain): 5 per cent mortality.
2. Fracture of the skull, dura intact: 9 per cent mortality.
3. Depressed fracture with a torn dura mater: 12 per cent mortality.
4. Tangential gunshot wounds with indriven bone fragments and severe local brain contusion (following which encephalitis and fungus cerebri are common): 24 per cent mortality.
5. Deep brain injury, the missile and bone fragments remaining in the brain: 37 per cent mortality.
6. Penetration of the brain by a missile with opening into the ventricle: mortality frequently 100 per cent.
7. Penetration of the skull and brain, with opening into one of the nasal sinuses or the middle ear cavity and subsequent infection: mortality frequently 73 per cent.
8. Through-and-through shot of the head. Patients with this type of injury usually die on the battlefield (also noted by De Martel), but if they live long enough to come to operation it is because the shot passed through a fortunate location. Even so, the mortality is usually 80 per cent.
9. Multiple, star-like fractures, with severe underlying contusion of the brain: mortality at least 50 per cent.

Methods by which the best surgery possible could be carried out during the stress of war have been repeatedly tried, changed, and discarded. No one of the warring nations seems to have struck upon the ideal means of caring for the man suffering from a severe craniocerebral injury. Many such units as the one to be described have been tested out, but many have failed in actual and prolonged use. The Royal Army Medical Corps has constructed a mobile neurosurgical unit which is practically self-contained (38). The vehicle of the unit is a motor lorry which carries a separate gasoline engine and dynamo. From this apparatus current is conveyed by cable to wherever the operating theater may be set up, for the surgical diathermy, suction pump, lights, and motor-driven instruments. It also charges a 12 volt electromagnet. The unit contains 2 sets of instruments, 2 operating tables with folding attachments, 2 instrument tables, and modern anesthetic equipment. Sterilization of water and instruments is done by a "primus" stove, and the unit also has a high pressure sterilizer, or autoclave, to sterilize linens and dressings. The personnel, travelling in the lorry, consists of a neurosurgeon, a neurologist, an anesthetist, 2 surgical assistants, and 2 nurses. It can work as one or two teams. Such a unit is designed to work at casualty clearing stations, but it depends upon a base hospital for its supplies. It can carry material for several hundred neurosurgical operations and can therefore remain in the forward area for weeks at a time. The actual value of this and other similar ingenious devices will be known only after the war is over and a full accounting has been made of the various methods of field surgery.

Jolly's recent book (49) on the surgery of warfare is recommended to all who would read the experiences of a man who has actually practiced field surgery in modern war (the Spanish civil war). The book is comprehensive yet conservative of words. The author stresses the value of the mobile surgical unit, of the necessity for immediate transportation of the wounded with early surgical care, and the need of proper rest for an adequate period of time after surgical treatment has been given.

INJURIES OF THE SPINAL CORD

While injuries of the spinal column are not infrequent among the general casualties of war, yet actual severe cord injury is not as common as one would suppose it to be, even in the fury of modern warfare. Much has recently been said about the methods of immediate diagnosis and transporta-

tion of a patient suspected of having a cord injury. Soto-Hall and Haldeman (3) demonstrated some time ago how the exact location of a spinal-cord injury could be determined without moving or otherwise disturbing the patient. With the patient flat on his back the neck is forcibly flexed, and due to a transmission of the ligamentous pull the patient will complain of pain at the segmental level of the injured vertebral body or arch when there is a fracture with compression of the spinal cord or roots. Such a test would be necessary only in injuries in which the spinal-cord embarrassment was sufficiently minimal to give no outright localizing signs. Wright (8) illustrated a simple neck brace, easily and cheaply made, which could be used efficiently on the battlefield for soldiers with cervical fractures, as a means of immobilization during transportation. Such an apparatus, consisting of an adjustable chest frame and chin-occiput supports, could be supplied in quantity and rapidly applied by stretcher bearers. Brookes (10) points out that one of the most important factors in the care of fresh fractures and dislocations of the cervical spine is their proper transportation to the place of *definitive* care. Several rules are to be followed: (a) "Splint them where they lie," that is, bring the splint to the patient, not *vice versa;* (b) the position must be with the patient on his back, head extended, head and neck in alignment; (c) immobilization, with simple collars, sandbags, firm pillows, or boards. Thomson (31), on the other hand, suggests that the patient be transported in a prone position, being carried not on a stretcher but on a blanket. Brookes makes the point that the cord may be irreparably damaged at the moment of injury, yet the dislocation may so completely reduce itself that no evidence is found on the x-ray film to account for the severe cord injury. Early reduction is always advisable. This is best done by traction, but careful manipulation may be done if traction alone fails to effect reduction. He believes that *early* laminectomy is a generally bad principle. Hyman (23) recommends the supine position for transporting patients with acute spinal injuries, and a simple canvas-covered board frame is all that is necessary. It can be made to hold the spine hyperextended, and in a shortage of beds it could be used for the permanent bed of the patient. He points out that the prone position for transport and emergency treatment of dorsolumbar spinal injuries, as advocated in 1931 by Watson-Jones, is not entirely logical. Patients in a prone position are difficult to examine and to nurse. If there are other injuries, such as of the chest, head, or cervical spine, they may be overlooked at the time the patient is first placed in the prone position, and for such injuries the prone position is certainly contraindicated. Furthermore the patient is always more comfortable in the supine position. In a review of 57 cases of injury to the spinal column in the R.A.F., Hall and Morley (46) found a high incidence of cervical fracture-dislocations. In reducing the dislocations, these authors found manual reduction, done under x-ray visualization and controlled by a registering dynamometer, better than skeletal traction. They put their patients up in hyperextension in plaster casts, and add that the complication of paralysis is no contraindication to hyperextension, as has been occasionally suggested, and that rather it is a strong indication for early reduction. They state that pressure on the cord caused by vertebral malposition may result in permanent damage through local anemia, though in many instances the initial paralysis of a cervical fracture-dislocation is due to a concussion of the cord and it will therefore be transitory. This latter statement, it would seem, is in general a bit overoptimistic. They reiterate what many neurological surgeons know all too well, that is, that it is sometimes impossible to tell early in the case whether the cord lesion is anatomical or physiological in nature. Naffziger (17) believes that in injuries of the spinal cord one must make sure as soon as possible just what the completeness of the injury is. In the presence of evidence of a complete lesion of the cord, persisting unchanged for twenty-four hours after injury, surgery is usually useless and in most cases permanent paralysis may be expected. Laminectomy, or other less radical means of correcting the bone defect, must be done to relieve pressure on the cord in the presence of evidence of an incomplete lesion. Commenting on war injuries of the spine recently seen, Knight (50) states: "A high proportion of the spinal injuries occurring in wartime will be of the closed variety, compressing fractures, and fracture-dislocations of the vertebral column..... Open wounds of the spine, compound fractures with or without division of the spinal cord, will be met with relatively seldom, for these injuries often prove rapidly fatal, not only on account of the shock and hemorrhage, but more especially from the fact that few such wounds can exist without grave associated injuries of the abdomen or chest, unless a bullet by evil chance should strike the spine exactly." He recognizes:

1. *Spinal concussion*, resulting from external blows, sudden bending, or from a jar due to the passage near to the cord of a large missile. The "concussion" usually produces symptoms of a complete physiological lesion.

2. *Spinal contusion,* frequently supposed to be the cause of the rather rare condition, hematomyelia. The most common cause of spinal contusion is a violent flexion of the spine, with snapping of the vertebral column at the junction of a fixed and mobile portion. The slipping forward of one vertebra on another may cause acute angulation and compression of the cord, and at such a site the angulation may not only have direct effect on the substance of the cord, but may so shut off the blood supply that anemia, venous stasis, and necrosis may extend over a very wide area.

3. *Spinal laceration,* due to direct bullet cut or a cut by a bone fragment. Such injuries always bear a bad prognosis, and at operation the gross appearance of the wound in the cord frequently belies the great severity of the injury. The prognosis is especially bad when cerebrospinal fluid drains from the wound.

Knight does not believe that laminectomy is ever to be considered in the *early* treatment of cord injuries. The first problem is to transport the patient to a hospital correctly and safely, in a prone position in moderate hyperextension. The spine should then be immobilized, traction (especially in cervical injury) should be used, and manipulation may be resorted to when it is deemed safe, although as a general routine procedure Knight condemns it. Sulfonamides should be begun early if the wound is an open one and potentially infected. The bladder must have special attention, and the problem of bed sores must be strenuously combated from the beginning of the hospitalization. There is seldom any need for urgent surgery.

Here, as in civil practice, one finds a disregard for or ignorance of the diagnostic value of a carefully performed spinal subarachnoid-space study and its help in establishing definitive treatment.

Under the best conditions of civilian practice the care of the bladder in a patient with a spinal-cord injury is always a major concern. Walker (13) states that the treatment of bladder complications following spinal-cord injuries in the first World War was one of the outstanding surgical failures of the war. He is unable to explain exactly why cord bladders should be especially hard to care for in times of war, but the difficulty probably lies in the restricted amount of nursing aid which is available in the wards. He does not recommend noninterference with the intended development of an overflow bladder, and neither does he deem the "manual expression" method safe under most conditions. He believes that the indwelling catheter is a useful method, and may be used until reflex or spontaneous micturition develops. It should be changed twice weekly, and the bladder should be irrigated once a day. Furthermore, it should be allowed to drain continuously. "If used with a stopper or clip to evacuate the contents of the bladder at convenient times it is merely a variant of intermittent catheterization with all its dangers." Certainly a real difference of opinion exists, and exception should be taken to this statement. He gives no consideration whatever to the fact that only by such a method can the bladder musculature be stimulated to become automatic in function. He recommends early suprapubic cystotomy for "prophylactic purposes," and by his method of so draining the bladder he does not fear infection in the space of Retzius. He states that this method is especially useful in old, long-standing cases, and that it allows for a more thorough disinfection of the bladder by irrigation. The suprapubic drain should be left in until cord recovery has occurred to such an extent as to make bladder function a certainty.

Kogerer (51) believes, contrary to the opinion of Knight, that hematomyelia is one of the commoner spinal-cord injuries of warfare. He believes that it is commonly overlooked, especially since it can be caused by somewhat minor accidents with indirect violence to the cord, such as a fall to the feet or buttocks, blows to the trunk, or sudden extreme movement of the spinal column. The most prominent symptom of hematomyelia arising from trauma is a dissociation of sensibility, especially with regard to pain and temperature. On the basis of his experience in the Polish campaign, Kogerer thinks that the prognosis of hematomyelia is at best uncertain. He remarks that opinion is sharply divided as to whether or not laminectomy should be done on such patients. Foerster believed that such cases deserved an exploratory laminectomy, especially in those instances in which after the first hour there appeared to be a spread of the vascular lesion cephalad.

The current literature is no exception to that of the past in containing reports of freak accidents, most of which are unworthy of note. Landau (12) reports the case of a patient with a bullet wound of the brain, the bullet entering the left frontal area and migrating down to the level of the fourth cervical vertebra; it was removed from this site with good recovery, two months after the original injury. Gesenius (43) reports several fractures of the spine and ribs in soldiers who had fallen on their gas-masks, in a war in which, fortunately up to this time, gas has not been employed.

PERIPHERAL NERVE INJURIES

It was not during, but in the years immediately after, the war of 1914 to 1918 that much of our present knowledge concerning the physiology, pathology, and surgery of the peripheral nerves came to light. The present war finds us woefuly little advanced in our fundamental understanding of injuries to the peripheral nerves, a lamentable fact in the realization of the economic importance of such injuries. Gosset and Bertrand (11, 15) point out that in the first World War more often than not peripheral nerve injuries were neglected in the acute state, and this was the reason for the large number of postwar operations on old war injuries. They insist that an immediate wound débridement and careful suture with fine silk be done, even if the wound should develop an infection, for in their opinion a nerve sutured in an infected wound is better than one left unsutured in the same infection. Hoche (5), basing his statements on his experience in the Italo-Albanian war, supports Gosset's viewpoint. He saw many crippling peripheral nerve wounds due to gun fire, and came to believe that they were among the commoner and most disabling of all war injuries. He saw many of them neglected in their fresh state, and he attributes many of the irreparable atrophies and contractures, so common in ex-soldiers, to the fact that their wounds were not cleansed and the nerves not sutured when the wounds were still fresh. Platt (58), an English surgeon of much experience states, "In through and through wounds from rifle, machine gun, or shrapnel bullets, the large nerve trunks quite frequently escape damage. Such nerve lesions as occur, tend to be localized and are often incomplete. But in wounds from high explosive missiles producing widespread destruction of soft parts and severely comminuted fractures, a nerve trunk may sustain considerable loss of substance. To the immediate damage produced by the missile there is added later the destruction wrought by suppuration, and during the final stages of healing further obliteration of conductive elements by scar tissue, both around and in the interior of the nerve trunk. In a limb so grievously injured, a nerve lesion is not necessarily the most important factor in the sum-total of the disablement." This surgeon saw, for diagnostic purposes, four syndromes in the acutely injured peripheral nerves: (1) complete block (complete motor and sensory loss); (2) incomplete block; (3) irritation, the severest form being manifest as causalgia; and (4) recovery, with the reappearance of motor and sensory function. At operation or in the fresh wound, the naked eye can see whether there is (a) complete division with a gap, (b) complete division without a gap, or (c) an intact nerve trunk presenting a localized lesion. If the problem is presented at a later date, when the original injury is healed but the nerve lesion persists, evaluation in the light of proposed surgical treatment of the nerve must be based alone on the signs elicited at examination. If the treatment is to be non-operative, the same program of physical therapy, with splints, massage, heat, and active and passive exercise, is to be carried out the same as would be done in the convalescent period after nerve repair. He adds, "*Primary* repair, as practiced with safety in certain civil injuries, has no place in the infected wounds of warfare. If a severely lacerated or completely divided nerve trunk is encountered in the course of the operation of wound débridement the existence of the lesion should be duly recorded, but no attempt made to repair the damage. *Secondary* nerve repair is not undertaken until the original wounds have been soundly healed for a period of at least six weeks, and the maximal nutrition and range of mobility have been restored to the limb by physical treatments and active use." So-called irreparable lesions are to be treated by tendon transplant or nerve graft. The latter may not be entirely favorable in gunshot wounds, and it remains for experience to show whether full caliber grafts can be successfully used to bridge long gaps in the larger nerve trunks of the peripheral nerves.

In this connection attention should be called again to the signficant work of Davis and Cleveland who showed experimentally and clinically that resection and resuture of the distal suture line of the nerve transplant, or graft, is necessary for the successful growth of axones into the distal segment of the divided nerve. Failure to appreciate the obstruction produced by the neuromatous formation at that point undoubtedly explains the failures recorded following the use of nerve grafts.

For causalgia Platt recommends the intraneural injection of 60 per cent alcohol or section of the nerve and immediate suture. At best, gunshot wounds of the peripheral nerves may turn out badly in the end. Some of the commoner causes of failure of return of function are (a) the end-results of wound infection, such as ascending neuritis and scar compression at the suture line; (b) long delay in effecting the repair; and (c) inaccuracy of regeneration.

Mitchener (26) advises the careful exploration of the wound tract when a patient presents a suspected gunshot wound of a peripheral nerve and blood vessels. Débridement of foreign material and devitalized muscle is one of the most important steps in the care of the wound. But more

important still is a careful examination for sensory and motor loss before the operation is begun, so that the surgeon will have in mind as accurately as possible the type and location of the lesion. Mitchener recognizes contusion, division, and ablation with loss of nerve substance as the three major injuries following gunshot wounds of the peripheral nerves. For *contusion*, when the nerve is hyperemic and edematous, no surgery is necessary. The extremity should be splinted to relax the muscles, and daily faradism should be employed until voluntary power returns. For *division*, the ragged ends must be cut cleanly away, the nerve ends sutured without tension through the perineurium, and the limb splinted in a relaxed position. The suture should be done, he insists, even if infection threatens, or even in the presence of actual but moderate infection. To him the results thereafter are as good as when the ends are only secured but not sutured end-to-end until after the infection has subsided, as recommended by Platt. In the event of *ablation*, if a large gap is present so that immediate repair by any means is impossible, the nerve ends should be buried by pulling the perineurium down over them to avoid the formation of a neuroma or adhesions to the surrounding tissue. He does not mention the use of nerve grafts in such cases. According to general experience, he found his best results were obtained in the primary sutures of the sciatic and radial nerves, and that residual weakness was present after the best of recoveries in the median and ulnar nerves.

Cairns and Young (36) believe that the peripheral nerve injuries of warfare differ from those of peacetime because of the usual presence of infection. Furthermore, nerves injured by gunfire are more likely to show a loss of a large amount of nerve substance, and in addition the nerve may suffer "internal" injury, not visible to the naked eye, well beyond the area of gross injury. The generally bad results of surgery of the peripheral nerves in war injuries are probably due to the factor of infection, but there is a remarkably large number of war injuries of the nerves which show spontaneous recovery, and for this reason Cairns and Young believe that it may be best to delay operation, especially when repeated careful sensory and electrical examination shows some return of function. They state, "It is not known whether the power of regeneration persists indefinitely in the central stump, or whether the peripheral stump is at all times equally able to receive new fibers." They suggest that the end organs and muscles may be too degenerate, a condition accounting for poor results after late sutures, that is, after eighteen months or more. They are undecided as to whether funicular apposition is important in end-to-end suture. They think that incomplete recovery in many nerves may be due to the fact that the new fibers do not grow out, except by mere chance, to the same type of end organs which they supplied in the original nerve. Pure sensory nerves and the radial nerve, mainly motor, give the best results after suture, and this may be because in these nerves of a more or less "pure" type, exact apposition of the funiculi is not so necessary. They do not believe that the reports of the nerve-graft operations of the war of 1914 to 1918 are very convincing in showing that such grafts are, by and large, significantly successful. They believe that the successful graft is the autograft, usually cable grafts of cutaneous nerves. This statement should be questioned seriously in view of the obvious mechanical defects of any type of a cable graft.

It remains to be seen whether the use of a concentrated blood plasma gel, as advocated by Young and Medawar (66), will find practical application in the peripheral nerve wounds of this war. Certainly there will be no dearth of material, and there should be an opportunity to show whether or not such an innovation, successful in the clean, fresh re-apposition of nerve ends in laboratory animals, can be applied to the more stringent but practical conditions of war wounds. Also, this war should provide ample opportunity for the support or disproof of the several theories concerning nerve grafts propounded by Gianotti (14, 21), Malan (25), Bentley and Hill (34), and Young, Holmes, and Sanders (67). The latter authors apparently do not believe that nerve grafts can be or have been successful to any degree in man. It is surprising and interesting to note the evident lack of knowledge which the English authors show concerning the work, both experimental and clinical, done by Americans in the last war. Huber's work, in particular, has been overlooked.

Very little has been written so far concerning gunshot wounds of the brachial plexus in this war, but such reports as are available (41) support the opinions of neurological surgeons gained from their civil practice, that is, that such injuries frequently offer a very bad prognosis, that recovery is seldom if ever complete, and that as a general principle physical therapy has as much or more to offer than surgery in the eventual recovery of these patients.

COMMENT AND CONCLUSION

In reviewing the current literature on the subject of the present day problems of the neuro-

surgeon in wartime practice, one is confronted with the disarming fact that actually nothing more effective is done for the patient with an injury of the nervous system in this war than has ordinarily been done in civil practice, and as a matter of fact in most instances the combatant patient does not receive, by any means, as good treatment as he would were he the ordinary civilian in times of peace. To account for this one must try to realize the strain, the terrific press of hundreds of patients, and the unavoidable confusion which must arise in the care of a large number of critically injured persons, especially as regards that care which must be given near the front lines where supplies are few, organization is unstable, and death threatens even the medical personnel. It is always much easier for the spectator of a combat to have a calmer perspective of the rapidly changing conditions at hand than it is for the combatants themselves. Neurological surgery, such as is being practiced now in Europe, is simply good civilian surgery practiced as well as it can be under the strenuous circumstances of war.

Disagreements on fundamental matters exist between surgeons of undoubted skill and experience. There is no common agreement on the treatment of acute cerebral edema; many general surgeons do not agree that craniocerebral injuries can best be treated only by the neurosurgeon; the actual technique of cranial repair varies widely in different hands; the method of reduction of spinal fractures is still fertile material for argument; no one has arrived at the ideal treatment of the cord bladder; and that no agreement exists as to whether or not a peripheral nerve should be sutured in an infected wound is quite obvious. Yet, these same subjects, and others equally as important will arouse the same argumentation among surgeons in civil practice, so that it is little wonder that variations in the ideals of treatment arise when an overwhelming number of patients are deposited for care under changing and otherwise difficult circumstances. Neurological surgeons need, therefore, only to apply sound surgical principles in wartime as in peacetime.

One danger must be kept uppermost in the mind of the surgeon caring for any wound received in war, and that is the specter of infection. In an excellent article dealing with the treatment of fresh wounds and burns, especially in relation to war wounds (which the author always considers to be grossly contaminated), Meleney (72) pleads for a comprehensive study of the treatment of fresh wounds, to be considered from the standpoint of delay in treatment, débridement, primary and delayed suture, antiseptics, chemotherapy, and roentgenotherapy. He believes that such problems are of fundamental importance in *all* surgery of warfare. Such a study should be carried out in a non-belligerent country, and the cost need not exceed more than, for instance, the total life insurance on but 35 soldiers! Properly conducted, such a study should lead to the solution of the greatest problem in the surgery of every war—the immediate treatment of wounds.

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ABSTRACTS OF CURRENT LITERATURE

SURGERY OF THE HEAD AND NECK

HEAD

Waldron, C. W., and Balkin, S. G.: Fractures of the Maxilla. *Surgery*, 1942, 11: 183.

The authors believe that the fracture lines in cases of fracture of the maxilla disregard anatomical boundaries and necessarily include all of the bones of the face with the exception of the frontal bone and the mandible.

Frequently the displacement produces a degree of malocclusion which makes it impossible to visualize the occlusion as it was before the accident. Study casts, therefore, should be made of the upper and lower teeth in most cases in order to determine the degree of displacement and rotation, and to make possible a more accurate application of the methods used to correct the displacement.

Associated fractures of the lower jaw, particularly if multiple and badly displaced, present great problems in the successful management of the cases. They tax the ingenuity of the surgeon, for new methods and appliances must be devised from time to time.

Fractures of half of the upper jaw with mobility can usually be nearly, if not completely, reduced by manipulation. In most cases, they should be maintained in correct occlusion by means of firm wiring of the teeth in occlusion of the uninjured side. At times, displacement may be very marked, particularly when there is depression of the molar region with the open bite anteriorly and replacement by manipulation and wiring is impossible. In such cases, the authors believe that a head appliance which makes the application of craniomaxillary force possible is indicated. To overcome the usual faults of the head appliance, the authors began using a steel verticle extraoral arm which slips into rectangular tubing on an upper dental splint, and extends forward between the lips and then upward to be attached to a temporal plate on the head cap. A universal joint which permits adjustment of displacement in all directions and planes, and when tightened is most secure, has been added. They now use a horizontal arm instead of the verticle extraoral arm, the end of which slips into the rectangular tubing on the arch bar maxillary dental splint. Except in extremely complicated cases with loss of many teeth and lack of occluding teeth in the mandible, the head appliances may be dispensed with in a week or so, and the teeth wired in occlusion in order to obtain a finger adjustment of the occlusion as well as a better result in the end.

The article is illustrated with several views of the universal head-cap appliance.

EMIL C. ROBITSHEK, M.D.

Pohl, L.: Extraoral Splinting of the Edentulous Mandible. *Lancet*, 1941, 241: 389.

In treating fractures of the edentulous lower jaw or cases in which resection of the edentulous mandible must be performed, difficulties may arise so that fixation cannot be achieved by the methods commonly used, such as intraoral splinting, splints in combination with flanges, saddles, hooks, screws, clamps, nails, circumferential wiring, and bandages. The principle of the method here described is the extraoral application of hookscrews into each fragment of the fractured mandible, with connection by a bar welded to them.

The hookscrew (Fig. 1), made of stainless steel, consists of three parts: (1) a hook ending in a sharp point, the shaft of which is square in cross section, (2) a simple screw tapered at one end with a square head at the other, and (3) a connecting rod between the two. The hookscrew is taken apart and, after the skin has been surgically cleansed, the hook is inserted, and applied against the thickest part of the bone, care being taken to avoid injuries to vital organs. After the hook is in contact with the bone, the connecting rod and screw are slipped over the hook and screwed tightly but not tightly enough to penetrate the marrow cavity. Three or four hookscrews should be sufficient to provide stability. With the hookscrews in position on both sides of the fracture a stainless steel bar 4 mm. thick is bent to shape according to this position. After aligning the fragments, the hookscrews are joined by means of the bar which is welded to them *in*

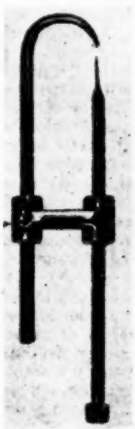

Fig. 1. The hookscrew.

situ with the Rakos welder. The Rakos process is fusion welding with a high resistance welding torch in direct contact with the pieces. A temperature of 3,000 degrees is developed within a fraction of a second and the weld is complete before the heat can be conducted to the patient. A cold water spray is sufficient to cool the metal.

Although the method has been used in only 1 case, it has been found to have certain advantages. There is no delay in preparing splints, and the hook-screws do not have to be removed for adjusting. The mouth and face are left free for surgical treatment. Feeding and mouth care are facilitated and there is less muscular atrophy. Its use is probably most suitable in cases with marked displacement and in those with considerable loss of substance, especially in the body of the mandible. BRADFORD CANNON, M.D.

Mowlem, R., MacGregor, A. B., Buxton, J. L. D., and Barron, J. N.: External Pin Fixation for Fractures of the Mandible. *Lancet*, 1941, 241: 391.

Fractures of the mandible in a tooth-bearing area present a problem which can be efficiently solved by purely dental methods. When the patient has no teeth or when the fracture occurs behind the tooth-bearing area, the accepted methods of fixation have not proved universally satisfactory. The authors therefore considered that the method with crossed Kirschner wires might enable them to apply direct skeletal fixation to the mandible. The apparatus consists of three main parts: a pair of pins and their locking plates on each side of the fracture line, and an intervening fixation bar. Standard 1.5 mm. Kirschner wires are used; they are cut from 2 to 2½ in. long and sharpened to a short bevelled pyramidal point. A pair of wires, crossed at an angle of 60 degrees, are introduced about ½ in. from the fracture line and close to the lower margin of bone. The outstanding ends of each pair of pins are locked together by screws which hold them to the locking plate. The intervening bar consists of two ⅛ in. rods, the longer one bent at a right angle, and the shorter one attached to an ⅛ in. tube with a set screw (Fig. 1).

The advantages of this method are that oral cleanliness is readily carried out and function at the temporomandibular joint is maintained. Postoperative discomfort is negligible and feeding is simplified. The disadvantage is the occasional necessity of treating the small residual scars. The apparatus has now been used in 19 cases, but its use should be limited to fractures which cannot be controlled by standard methods. BRADFORD CANNON, M.D.

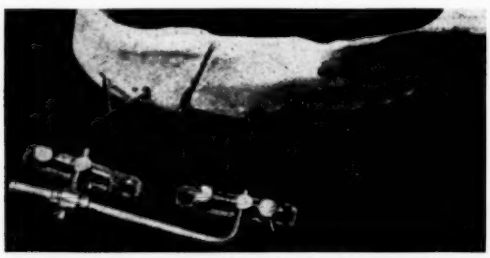

Fig. 1. The apparatus described in the text applied to a skeleton jaw.

Kanthak, F. F.: X-Ray Irradiation and Osteonecrosis of the Jaws. *J. Am. Dental Ass.*, 1941, 28: 1925.

The adverse effect of heavy x-ray or radium therapy on osseous structures is fully appreciated by those treating tumors of the head and neck, but that such irradiation presents a contraindication to the extraction of teeth is not fully appreciated.

Three definite factors seem to be conducive to osteoradionecrosis. The first is the irradiation, which tends, not only to destroy the normal resistance of the tissue to infection and its response to healing, but also to alter the entire process of healing. The second is infection, which is induced by poor oral hygiene, general lack of care of the mouth, and the retention of carious and broken-down teeth. The third is trauma, usually produced by the simple extraction of a tooth. After the extraction, the socket fails to heal and the soft tissues seem to melt away and leave a large portion of exposed bone. Suppuration is profuse and there is steady dull pain. Sequestration is usually delayed more than six months. After sequestrectomy it is advisable to hold the jaw in correct occlusion with elastic traction to reduce deformity and functional disability.

Because of the relatively high incidence of osteoradionecrosis of the jaws following radiation treatment of neoplasms of the oral cavity and contiguous structures, it is evident that all infected teeth or questionable teeth should be extracted, the remaining teeth cleaned, and the mouth put in as good condition as possible, prior to treatment. It may occasionally be wise to remove all teeth.

X-ray pictures, photographs, and histories of 2 cases are presented. BRADFORD CANNON, M.D.

EYE

Wiener, M., and Rosenbaum, H. D.: Experimental Corneal Transplantation. *Am. J. Ophth.*, 1941, 24: 1384.

One of the most difficult problems in corneal transplantation is the procurement of adequate material which can be used for grafting. Since it is often difficult to secure good fresh grafts, it was decided to test the possibility of using fixed grafts.

This idea is not new. It was inspired by the work of Salzer, in 1911, who first reported the use of formalinized corneas in transplantation on rabbits.

Much of the work since 1911 has been done with the idea of confirming or disproving Salzer's original concept. He believed that the graft acted only as a guide for the ingrowth of new tissue from the cornea of the recipient.

In recent years many men have used cold as a means of preserving the grafts which have been

placed either in so-called Locke's solution or in blood serum.

Keratoplasties were done in the experimental work of the authors. Five of these were transplantations of formalinized dog corneas to rabbits and 17 were transplantations of chemically fixed rabbit corneas to rabbits. In the first group the postoperative reaction was more intense than that which occurs with fresh grafts, but the grafts did not slough. All of these grafts became vascularized. In the second group 9 formalinized rabbit-to-rabbit transplants were attempted; 8 healed. Three of these show signs of clearing. Histologically, the grafts showed an orderly ingrowth of new corneal fibers with numerous corneal corpuscles in evidence. The fate of the donor's stroma is in doubt, but it appears quite certain that Descemet's membrane was not replaced. Washing of the graft is of great importance, and the whole problem of formalinized grafts is worthy of further study.

Eight grafts were made, with corneas fixed in Petrunkowitsch's solution. Seven of these took, but the grafts seemed more cloudy than those on which formalin was used.

The author's transplantation technique is also discussed. IRVING PUNTENNEY, M.D.

Berens, C., and Bogart, D.: Immediate Complications of Operations for Acquired Cataract. Certain Complications Affecting the Anterior and Posterior Segments of the Eyeball. *Am. J. Surg.*, 1941, 54: 346.

From their investigation of complications affecting the anterior segment of the eyeball following cataract operation the authors state:

1. The prevention of immediate complications following cataract extraction is important if unnecessary blindness is to be eliminated. A thorough preoperative study of patients with cataract and the treatment of focal infections, as well as other general diseases, are essential in order to eliminate some complications following the extraction of cataract.

2. A study of 1,004 intracapsular and extracapsular cataract extractions apparently demonstrates that the percentage of immediate operative complications is about the same following either procedure.

3. Cataract extraction after preliminary iridectomy apparently is still considered the safest operation by some ophthalmic surgeons, especially if complications are present preoperatively.

4. The average age of the patients included in the intracapsular group was sixty-five years and in the extracapsular group sixty-two years.

5. In this study the loss of vitreous, hemorrhage, and the necessity of extraction by means of a loop were the most common immediate complications in cataract extraction. Loss of vitreous occurred in 30 cases (9.9 per cent) of the intracapsular group and in 63 cases (9 per cent) of the extracapsular group. Loss of vitreous apparently is a more frequent complication of intracapsular extraction than of extracapsular extraction. However, the comparative freedom from inflammatory postoperative complications when the intracapsular method is used must be considered in the final evaluation of the methods. Hemorrhage occurred in 12 (4 per cent) of the intracapsular group and in 10 (1.4 per cent) of the extracapsular group. Contrary to expectation, the incidence of hemorrhage into the anterior chamber was markedly different in the intracapsular and extracapsular methods, and the authors had no logical explanation of this fact. In this series of cases the lenses were extracted by means of a loop in 34 of the 702 extracapsular extractions and in only 4 of the 302 intracapsular operations. The fact that in the extracapsular series a majority of the cases had complications preoperatively must be considered. The other complications occurred in only a few cases of both groups of operations.

From their studies of complications relative to the posterior segment of the eyeball the authors conclude:

1. Loss of vitreous apparently occurs more frequently in intracapsular extraction of cataract than in extracapsular extraction.

2. There was a higher percentage of hemorrhages in the intracapsular group of cases.

3. Expulsive hemorrhage occurred in 0.7 per cent of the intracapsular series and in 0.43 per cent of the extracapsular series.

4. Although detachment of the chorioid was observed in only 1 case of intracapsular extraction, certain surgeons believe that it occurs in almost all cases at the time of operation.

5. The visual results in cases in which glaucoma was present preoperatively were better following extracapsular extraction. A comparison of the percentage of hemorrhages in the anterior chamber occurring in the intracapsular and extracapsular series of cases with the percentage occurring in the glaucomatous cases revealed a slightly higher incidence in the glaucomatous patients. This was true also in regard to the amount of vitreous lost. In the glaucomatous cases loss of vitreous occurred in 3 per cent, while in the non-glaucomatous patients the percentage of cases in which vitreous was lost was 2.2 per cent.

6. Following intracapsular and extracapsular extraction of cataract in diabetic patients, the visual results and other complications were approximately the same as in cases uncomplicated by diabetes. Hemorrhage in the anterior chamber occurred in 4 (3 per cent) of the 148 cases of diabetes, while the percentage of hemorrhage in the anterior chamber in the 1,004 cases was 2.2 per cent. The preoperative administration of Vitamins C and B seems to be rational therapy. Contrary to expectation vitreous was lost in only 7 per cent of the diabetic cases and in 9.2 per cent of the 1,004 cases.

7. Some of the points which should be considered in the prevention of immediate complications of cataract extraction are:

a. Careful preoperative study of the patient and the administration of appropriate treatment.

b. If the tension is elevated, the intraocular pressure should be reduced before operation by miotics or the operation should be followed by extracapsular extraction; when intervention is urgent posterior sclerotomy may have to be performed as a preliminary measure if avertin or a retrobulbar injection of procaine and epinephrine hydrochloride fails to lower the tension.

c. Preoperative lowering of the general blood pressure by rest and other means, and if the retinal blood pressure is known or believed to be elevated, the intraocular pressure should be lowered by injection of the ciliary ganglion at operation.

d. Extracapsular extraction in cases of increased tension within the vitreous.

e. Complete anesthesia and akinesia of the eyelid and eyeball must be obtained: eyelid and retrobulbar injections in all cases should be combined with a subconjunctival injection of procaine.

f. Insurance of a perfect section well protected is secured by proper introduction of the Graefe knife and by obtaining a complete conjunctival flap.

g. Injury to the iris is prevented by complete anesthesia, withdrawal of the knife if the point engages the iris, and by making a small incision with a curved or scimiter-shaped cataract knife or hollow ground keratome if the anterior chamber is shallow; this is followed by enlargement of the wound.

h. Sutures which may be quickly tightened should be in place before the lens is extracted and should be tied before the anterior chamber is irrigated or the iris respositor is used.

i. The incision should be large enough to prevent undue pressure on the eyeball in expressing the lens.

j. Complete discission of the anterior capsule is necessary, or if the capsule forceps are used the anterior capsule should be grasped near the equator where it is thickest, first below and then above, with only a narrow bite.

k. Excessive pressure is avoided with fixation forceps when the incision is made.

l. Undue pressure and traumatism must be eliminated throughout the operation.

m. Sudden movement of the eyeball is prevented by the insertion of a suture in the superior rectus muscle after anesthesia is produced with a subconjunctival injection of 2 per cent solution of procaine.

n. Complete or peripheral iridectomy is used to prevent prolapse of the iris.

o. In diabetic patients hyperglycemia is to be controlled by diet if possible so that the use of insulin may be discontinued for several weeks before the operation.

p. In excessively nervous or irritable patients, the use of avertin or evipal anesthesia must be considered.

LESLIE L. McCOY, M.D.

Parkhill, E. M., and Benedict, W. L.: Gliomas of the Retina. *Am. J. Ophth.*, 1941, 24: 1354.

A series of 35 tumors of the retina was studied and, on a histological basis of differentiation of tumor cells, was divided into two groups, an extremely undifferentiated retinoblastoma type, and a partially differentiated neuroepithelioma type. A third, well differentiated astrocytoma type, an example of which was reported by McLean, was not represented in this series. The following conclusions were drawn:

1. Neuroepitheliomas seldom, probably never, arise from the rod-and-cone cells of the retina.

2. Gliomas of the retina of any type arise most often in the inner nuclear layer, less frequently in the ganglion-cell and nerve-fiber layers, and rarely, if ever, in the outer nuclear layer.

3. In cases in which regions of normal retina still persist, an appearance of multicentric origin of the tumors is frequent.

4. Retinal tumors probably do not arise from embryonic rests nor from persistent primitive epithelium, but from normal cells that have dedifferentiated to produce tumor cells.

5. The cells from which the tumors arise are probably most frequently, if not always, glial cells.

6. The most undifferentiated of the tumor cells are the small cells with hyperchromatic polygonal or wedge-shaped nuclei that predominate in the retinoblastomas; they are extremely anaplastic and do not correspond necessarily to any known cell of normal retinal embryogenesis.

7. Cells in rosettes are not rod-and-cone cells and are much less differentiated than are rod-and-cone cells.

8. The formation of rosettes is an evidence of partial differentiation of the tumor cells to a point at which they resemble more or less closely the cells of the primitive neural tube.

9. The formation of pseudorosettes also signifies differentiation of the tumor cells, probably almost to the degree attained by the cells of true rosettes. The alignment of epithelial-like cells into rows and bands, sometimes surrounding blood vessels, also is a manifestation of a slight degree of differentiation.

10. Results in the retinoblastoma group were poor (only 2 cases with good results, or 12.5 per cent of 16 traced cases) as compared with those in the neuroepithelioma group (10 cases with good results, or 62.5 per cent of 16 cases traced).

Brunner, H.: Rhinogenic Retrobulbar Neuritis. *Laryngoscope*, 1941, 51: 903.

Many clinicians consider rhinogenic retrobulbar neuritis as a rarity and some even deny its existence. Consequently an investigation was attempted by the author to determine the signs which lead to such a diagnosis. The author discusses: (1) anatomy, (2) treatment, and (3) pathology.

From an anatomical standpoint, only the sphenoid and posterior ethmoids frequently show an intimate relation to the optic nerve, and these sinuses may have a close connection with the optic nerve on both sides. This explains the relationship between bilateral optic neuritis and unilateral sinusitis.

The wall between the posterior ethmoids and the optic canal is usually thin as paper, but the wall be-

tween the sphenoids and the canal may vary from 1 to 12 mm. Consequently, an infection of the posterior ethmoids is at least as dangerous as one of the sphenoids. In simple retrobulbar neuritis, however, the invasion of the optic canal seldom occurs, and consequently the infection reaches the optic nerve along the pathways of connective tissue, blood vessels, and nerves. Of these the veins are probably the most important structures for the conduction of the infection.

A review of the literature shows that numerous cases have been reported which improved after intranasal treatment, and many of these have been followed for from six to ten years without the appearance of disseminated sclerosis. This seems to prove that rhinogenic retrobulbar neuritis actually exists. Several of these cases are summarized from the review of the literature.

The following diseases are of importance in the etiology and differential diagnosis of retrobulbar neuritis: neuromyelitis optica, syphilis, disseminated sclerosis, Lebers disease, tobacco amblyopia, vascular disease, hysteria, and toxic amblyopia.

The author believes that it is necessary to combine conservative and surgical management in the treatment of these cases. These measures are summarized. IRVING PUNTENNEY, M.D.

EAR

Lempert, J.: Fenestra Nov-Ovalis. A New Oval Window for the Improvement of Hearing in Cases of Otosclerosis. *Arch. Otolaryngol.*, 1941, 34: 880.

The creation of the fenestra nov-ovalis is a step forward, according to Lempert, in the evolution of fistulization of the labyrinth. After careful investigation and study of the results obtained in 300 fenestrations of the external semicircular canal, the new oval window was conceived and designed to overcome an important obstacle to still greater success with this type of operation. The author

Fig. 1. Technique. The illustration shows the anatomical relationship in position of the fenestra ovalis and the fenestra nov-ovalis in the vestibule.

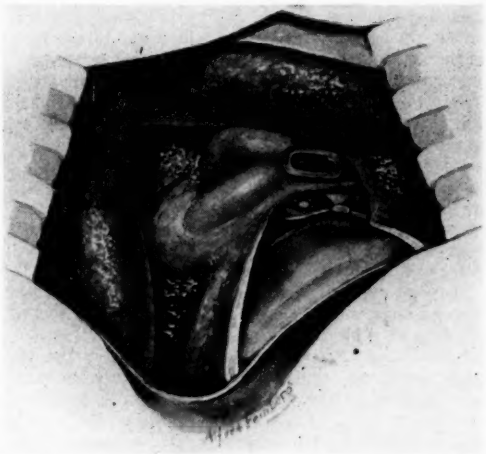

Fig. 2. Technique. The fenestra nov-ovalis with an obturator frame *in situ*.

created the fenestra nov-ovalis in 75 patients during the last eighteen months. In not 1 of these patients has the newly created vestibular fenestra closed or shown the slightest tendency toward closure. This promising new consecutive "high" for continued patency of newly created labyrinthine fenestræ caused Lempert to abandon fenestration of the external semicircular canal, and he is now fenestrating the vestibule proper in all his cases.

The comparatively large dimensions of the perilymphatic space in the region of the fenestra nov-ovalis offer an opportunity for inserting and permanently maintaining in direct contact with the lateral bony walls of the fenestra an inert metal obturator frame, in order to prevent (mechanically) the fenestra from closing. The observations reported indicate that the fenestra nov-ovalis is anatomically the best placed, histologically the best constructed, and physiologically the best functioning hearing-window conceived and employed to replace a functionally impeded fenestra ovalis. Like the fenestra ovalis, the fenestra nov-ovalis communicates directly with the scala vestibuli. Like the fenestra rotunda, it is covered and protected by the thinnest possible membrane, both the inner and the outer surface of which are epithelium lined.

NOAH D. FABRICANT, M.D.

MOUTH

Martin, H.: The Treatment of Cervical Metastatic Cancer. *Ann. Surg.*, 1941, 114: 972.

The author notes that the treatment of cervical metastases is a problem which confronts every surgeon and radiologist who deals with intraoral and pharyngeal cancer. Since the results of all methods of treatment fall so far short of a complete solution, the question of treatment must be ap-

proached openmindedly, in its broadest aspects. There is a wide divergence of opinion as to the best methods of treatment for cervical metastatic cancer. Surgery and radiation both have their exponents, while some radiologists and surgeons of considerable experience doubt the possibility of cure by any method. From the practical standpoint, the problem may be considered under two headings: (1) prophylactic treatment, or that which is given in the absence of clinically demonstrable metastases, and (2) curative treatment given for clinically positive metastases. A detailed discussion of each of these forms of treatment is given.

Surgical exposure is indicated when the node lies deep under a thick layer of subcutaneous fat, where the accurate placement through skin punctures is not possible by palpation alone. The only justifiable surgical method for the treatment of cervical metastases is neck dissection, which implies the complete removal in a given area of all lymph-node-bearing tissues between the superficial subcutaneous fat and the fascia covering the deep muscles of the neck. The extent of such an operation may vary from a local dissection of the submental and submaxillary triangles to a complete, or block, dissection extending from the lower edge of the mandible and the mastoid to the clavicle, and from the anterior border of the trapezius forward to the midline. A form of incision, usually a variation of the crucial or the trifurcate, should be selected which will permit adequate exposure of the operative field. Local is preferable to general anesthesia. The highest mortality rates are usually reported from those clinics in which general anesthesia is used routinely.

The value of preoperative and postoperative radiation in small doses is often brought up for discussion. Until about 1930 it was a common practice in all cancer clinics to apply small doses of radiation to the operative field either immediately before or immediately after practically all operations for cancer. The theory for giving preoperative radiation was that the malignancy of the tumor and its tendency toward dissemination during the operation would thereby be reduced. The theory for giving postoperative radiation was that if any cancer cells had been missed or had been spilled into the operative wound, these small doses of radiation would destroy them so that subsequent recurrence would not take place. From the author's experience, he concludes that the attempts to apply cancer lethal doses preoperatively or postoperatively usually result in rather tragic failures of wound healing.

The combination of surgery and radiation may also be effectively combined during neck dissection when a metastatic node, thought to be operable, is found to infiltrate the capsule into a structure which cannot be widely excised.

The prognosis in cervical metastatic cancer is by no means hopeless. The chance of cure is best in those patients who develop metastases late in the course of the disease. It is worse in those who already have metastases at their first examination.

Using only proved nodes, end-results would be calculated in more than one way. The efficacy of neck dissection in selected, early, operable cases, all histologically positive, is proved by the fact that 26 per cent of the patients have survived for over five years. Since all cervical nodes not treated by surgery, including the inoperable and hopelessly advanced and palliative cases, receive irradiation, no cure rate can be calculated for any significant comparison with neck dissection. At the Memorial Hospital, New York, 46 patients with histologically proved metastatic cancer treated by radiation alone survived for five years or more. These cases do not necessarily represent all the cures, but only those in which aspiration biopsies were made.

HERBERT F. THURSTON, M.D.

NECK

Havens, F. Z., and Parkhill, E. M.: Tumors of the Larynx Other Than Squamous-Cell Epithelioma. *Arch. Otolaryngol.*, 1941, 34: 1113.

This study is based on a series of unusual laryngeal neoplasms observed in the Mayo Clinic over a period of thirty years and includes a survey of the pertinent literature in English covering the same period.

In a series of approximately 1,100 cases of malignant disease of the larynx, the authors found that for each 44 cases of squamous carcinoma there was 1 case in which some other type of malignant disease was present. Although the treatment of other types of malignant disease of the larynx should follow the same general principles as those laid down for the treatment of carcinoma, there are certain important points to be borne in mind. Sarcoma of the larynx is likely to be found amenable to treatment by conservative operation and to offer a good prognosis. Adenocarcinoma of the larynx may become very extensive before it is recognized but may be curable by radical surgical treatment in spite of this. Hemangioendothelioma responds well to treatment by removal and irradiation of the site. Melanoepithelioma and myeloma of the larynx may be classified as medical curiosities. The former is likely to be incurable, but the latter should respond well to appropriate treatment.

Galloway, T. C.: The Choice of Treatment of Cancer in Otolaryngology. *Ann. Otol., Rhinol. & Laryngol.*, 1941, 50: 1018.

If an otolaryngological tumor has been of slow growth, if its border is rolled or heaped up to suggest local-tissue resistance, if it is papillary or excrescent, if it does not infiltrate and does not fix the tissues in the depth, or if it seems somewhat encapsulated, it is likely to be amenable to surgery. If it has grown rapidly, is not papillary or well limited, though it may be fungating, and has not deeply infiltrated, irradiation is more likely to be effective.

The histology of tumors has been stressed as a guide in treatment, but it is subject to strict limita-

tions and some authorities pay little attention to it. Anaplasia, lack of cell maturity, atypical cells, and abundant mitoses indicate sensitivity to irradiation in probably 90 per cent of the cases of epithelial tumors. They usually indicate rapid growth, early extension, and early metastases, and usually point to some degree against surgery. Such types in the sinuses and on the cords may, because of other factors, still be surgical, although, as New showed in the larynx, a greater zone of sound tissue may need to be removed. Tumors with well matured cell forms, with much stroma, with hornification, or with other indications of specialization yield well to electrosurgery and often poorly to irradiation. Very immature cell forms, undifferentiated, with little stroma, especially epidermoid tumors approaching Grade IV of Broder's classification, respond very well to radiotherapy.

Certain definite types of tumors have been found, more or less empirically, to have specific response to therapy. For instance, the so-called lymphoepithelioma melts away rapidly under radiation, usually has metastases when first discovered, which are extensive in proportion to the primary growth and probably never should be treated surgically, but in spite of early favorable response it is seldom cured by irradiation. Transitional-cell carcinoma grows rapidly and responds well to irradiation, but on the cords and in the sinuses may be limited for some time and be amenable to surgery.

The patient's condition should help determine the treatment. Surely no radical treatment should be used which will not increase an expectancy which is already limited by some other disease, or at least make remaining years more livable. For that reason advanced tuberculosis, diabetes, and cardiovascular or renal disease strongly indicate irradiation in cancer of the larynx. Biopsy is essential to proper treatment.

Skin lesions of most types may be treated by either surgery or irradiation, though electrosurgery is definitely safer; on the other hand, the cosmetic advantage may be with irradiation. Basal-cell carcinoma, if early, should be cured by either. Squamous-cell carcinoma even if of very mature cell type can usually be destroyed by an epidermicidal dose of radium or roentgen rays. Around the eye the cosmetic effect makes the preference for radium although the question of lens injury must be considered even with the best efforts at screening.

In lip cancer, local radon implantation, pack, or wedge resection gives excellent cosmetic results. The best results in the more extensive lesions have apparently resulted from electrosurgery followed by local radium and regional x-ray therapy. Carcinoma of the buccal mucosa is in about the same category. The overlying skin can at times be saved by reflection before coagulation.

Carcinoma of the tongue is an unfavorable lesion since it is usually of an infiltrating type, invades early along the muscle fibers and into the free abundant regional lymphatics, and occurs typically in foul mouths with infection. Most of these the author treats with radon implants and regional x-ray or radium therapy. If the lesion involves the tip or border of the anterior one-third of the tongue or if it is papillary or fungating without fixation electrocoagulation gives a high percentage of satisfactory results. If the floor of the mouth is involved, especially with invasion of the bone or fixation over it, electrocoagulation is usually necessary. The posterior two-thirds of the tongue is more often involved by an infiltrating lesion; the outlook is bad, and probably local radon and external irradiation should be used. If the lesion has arisen from the epiglottis or the epithelium of the pillars and as yet lies superficially, coagulation may be useful.

Cancer arising from the oral mucosa around the maxilla quickly involves bone, metastasizes relatively early on account of the free lymphatic drainage, and yet is fairly favorable and responds less well to irradiation than electrocoagulation.

For malignancy involving the sinuses and nasal chambers, combined treatment seems the treatment of choice. Electrocoagulation is used to gain access to very radiosensitive tumors or to destroy as completely as possible more resistant forms; it is followed by radium applied locally and x-ray treatment given over the regional glands. Cancers of the lower third of this area which arise primarily outside of the sinus most often yield well to surgery although metastases are common. At or just above this level in the sinus or nasal chambers the tumors are less favorable to surgery and combined treatment gives best results. Least favorable are those in the upper third of the nasal sinuses and nose, where more reliance must be made on irradiation.

Carcinoma of the epiglottis is likely to be of the mature-cell type and usually will erode the cartilage and eventually spread to the base of the tongue. It is less likely to respond to irradiation. The other tumors of the pharynx are likely to be anaplastic, spread early and widely by way of the lymphatics, and respond primarily well to irradiation, but they tend to recur in the glands. Pharyngeal carcinoma can be whipped up by surgery and even by electrocoagulation, which should almost never be used.

Occasionally a postcricoid growth is of low enough virulence and is diagnosed early enough that it can be removed surgically. There are, however, very few operators who have the temperament and skill to justify the radical external approach which gives relatively few favorable reports. With the exception of tumors of the epiglottis and a very few others well delimited and of mature-cell type which are accessible to diathermy, there are few indications to treat cancer of the pharynx by any other method than irradiation.

Nowhere does surgery give more brilliant results than in well localized cordal cancer, in cases without fixation and not involving the posterior third; cures are obtained in up to 88 per cent of the cases. Nothing in the author's experience indicates that primary treatment should be by irradiation.

For cordal malignancy extensive enough to indicate laryngectomy, irradiation may be an even choice.

Subglottic tumor is usually infiltrating, radioresistant, and more extensive than thought before operation, and there seems little question that it requires laryngectomy, or perhaps if unilateral, hemilaryngectomy.

Tumors of the ventricular bands have usually extended posteriorly, but they also respond well to irradiation, which is probably preferable. Tumors above this area also have usually extended too far for any but the most heroic surgery, and irradiation probably should be used on them. The relatively rare cancers of the sinuses of Morgagni are usually radioresistant and require laryngectomy if operable at all.

Cancer of the auricle is frequently a deceivingly innocent lesion which has advanced much farther along the perichondrium than suspected. The author advises complete removal of the auricle and coagulation into the canal. It does not seem to him that irradiation has done much for these patients.

Middle-ear and mastoid carcinomas are usually mature and invasive, and are not diagnosed until bone is involved. Removal by bone instruments with a clean-up electrocoagulation offers some possibility of cure.

Carcinoma of the esophagus is at about the stage of surgery where cancer of the larynx was fifty years ago. Some of the obstacles, notably infection, pulmonary collapse, and hemorrhage, which have been considered inherently forbidding seem to have been surmounted, and enough cases have been successfully treated by surgery to make a real promise for the future.

JOSEPH K. NARAT, M.D.

Morrison, W.: Physical Rehabilitation of the Laryngectomized Patient. *Arch. Otolaryngol.*, 1941, 34: 1101.

In the late postoperative period the laryngectomized patient is apt to suffer from mental depression because of the social and economic barriers and burdens imposed on him by total aphonia.

The best cure for this depression is a well guided attempt to learn to produce and use the pseudovoice.

The mechanism of such speech is simple. It can be learned by any patient of average intelligence and vigor if he tries patiently and is guided by an interested and sympathetic physician.

The advantages of the pseudovoice over any other substitute for the lost voice are numerous, and they are entirely practical. Life after removal of the larynx for cancer cannot be the same as before. The laryngectomized patient must be guided, instructed, controlled, and supervised for at least five years after the operation. The management of this physical and mental rehabilitation should rest in the hands of a practicing otolaryngologist.

JOHN F. DELPH, M.D.

SURGERY OF THE NERVOUS SYSTEM

BRAIN AND ITS COVERINGS; CRANIAL NERVES

Vasconcelos, R.: A Study of 100 Abnormal Electroencephalograms (Estudio sobre 100 electroencefalogramas anormales). *Med. rev. mex.*, 1941, 21: 505.

Vasconcelos has taken his material from the Electroencephalography Department of Ward 16 of the General Hospital of Mexico City. The examinations were made in the morning on patients who had not received any drugs from forty-eight to ninety-six hours, and the period of the registration ranged from a minimum of fifteen to a maximum of forty minutes. Eight electrodes were used: six active ones on the frontal, central, and occipital regions of both sides, and 2 indifferent ones on the lobes of the ears. Monopolar examination of the six regions was followed by bipolar exploration. In this study, the frequencies between 8 and 11 per second are regarded as alpha waves, those between 20 and 30 as beta waves, and those between ½ and 4 as delta waves. Higher frequencies are considered as parasitic undulations due to defects in the isolation and filtration of the alternating current.

Of the 100 abnormal electroencephalograms, 70 were taken in 52 epileptic patients: of these patients, 40 had essential and 12 focal epilepsy, 30 were males and 22 females, and their ages ranged from six to eighty-four years. No concordance could be found between the clinical and the electroencephalographic forms as described by Lennox and Gibbs in 1936 (petit mal, psychomotor epilepsy, and grand mal); instead, there was evidently a constant direct relation between the severity of the clinical picture and both the quantity and quality of the abnormalities in the tracings. The author has made an attempt to divide these abnormalities into three successive stages: the first one, corresponding to mild epilepsy, would be Jasper's paroxysmal hypersynchrony, or complex of petit mal with isolated spikes; the second, corresponding to average epilepsy, would be Lennox and Gibbs' paroxysmal dysrhythmia; and the third, corresponding to severe epilepsy, would be a total or nearly total disintegration of the electroencephalogram.

The second group includes 13 tracings taken in 9 patients with brain tumor: 4 males and 5 females whose ages ranged from eighteen to fifty-eight years. Six of the tumors were demonstrated at operation or necropsy and consisted of 4 meningiomas, 1 suprasellar tumor, and 1 cysticercus cyst of the fourth ventricle; the other 3 cases corresponded clinically to 2 tumors of the hypophysis and 1 tumor of the left temporal lobe, and their localization was probably accurate. The meningiomas gave the greatest number of delta waves through the electrode which was placed immediately over them. In the suprasellar and hypophyseal tumors, the electroencephalograms taken with the usual leads on the scalp were normal; but delta waves were registered with a basal or rhinopharyngeal electrode. In the case of tumor of the fourth ventricle, the greatest number of delta waves was obtained over a zone of about 3 cm. situated immediately behind and above the base of the mastoid process and corresponding to the insertion of the cerebellar tentorium; this seems to suggest that the delta waves originating in the lower part of the left occipital lobe are transmitted to the left cerebellar lobe to appear in the zone where they were registered.

The third group includes 9 tracings taken in 9 cases of various craniocerebral traumatisms, ranging from a case of simulation to 1 of fracture of the base with a severe cerebral lesion which caused the death of the patient. In all injured cases, the electroencephalogram showed the localization and the extent of the lesions, while it was normal in the case of simulation.

The final group consists of 8 cases which demonstrate the concordance between the clinical data and the electroencephalographic findings. One of these was an occipital hematoma, the localization of which had been accurately established by following Jasper's orientations. A syphiloma of the temporal lobe and an abscess of the frontal lobe both gave a well defined zone of delta waves. These remaining cases corresponded to organic cerebral diseases.

RICHARD KEMEL, M.D.

Northfield, D. W. C.: Angiomatous Malformations of the Brain. *Guy's Hosp. Rep.*, Lond., 1940–41, 90: 149.

Vascular or angiomatous malformations of the brain are not as rare as has been formerly thought, and the possibility of making an accurate diagnosis of a lesion of this type before operation is not as difficult as is usually supposed. This is the thesis which the author demonstrates in this article. His experience is concerned with 14 cases of malformations of the blood vessels around the brain, of which 9 were arteriovenous malformations, 1 was not determined, 2 were venous malformations, and 1 was a Sturge-Weber's type of malformation.

There has been, of course, some difficulty with regard to the nomenclature in these cases and that used by the author is not the same as that most commonly known to us in this country, which was suggested by Bailey and Cushing. A few case histories are reported and a classification, according to the author, is inserted in the article. There are in addition some good photomicrographs of various lesions, as well as some illustrations of the roentgenological findings in these cases. The author goes carefully into the clinical manifestations and the histories of his patients. Although most of the lesions

imply a congenital origin, nevertheless they are precipitated by events in adult life. There was 1 case of the Sturge-Weber type of angiomatous formation with nevi in various other parts of the body and the scalp. For the main, however, these were arteriovenous malformations which are known to us in this country as arteriovenous aneurysms.

Headaches, epilepsy, and intracranial hemorrhage are the most common manifestations of the angiomas. Papilledema is usually absent but may be present in a mild degree. Glaucoma occurred in 2 of the 14 cases. Intracranial bruit may sometimes be heard but is rarely noticed by the patient. The roentgenological examination may show various things. The skull may show increased vascular markings or there may be abnormal deposits of calcium salts within the cranial cavity, and one author says that this occurs in 80 per cent of the cases. Sometimes the shadows are mere flecks, but at other times the opacities give the impression of a tangled group of vessels. Arteriography is one of the most important diagnostic methods used for preoperative diagnosis of these lesions, and for this purpose 10 cc. of thorotrast are injected into the internal carotid artery. Air injections are not considered to be of any particular value.

In the differential diagnosis the problem of migraine, congenital aneurysm, and slow-growing tumors are of primary consideration. These malformations are particularly likely to be mistaken for congenital aneurysms when they bleed into the subarachnoid space. The picture may then be indistinguishable from a congenital aneurysm. The treatment resolves itself into surgical procedures and roentgen therapy. Although total removal of the lesion would be the procedure of choice, in a great number of cases it is technically impossible, both from the point of view of hemorrhage and the point of view of further serious damage to the brain. Decompression with roentgen therapy seems to give the best results at the present time. Carotid ligation may be useful.

The outlook for the patients is better than would be supposed. Most of the patients in this series have been followed up for a period up to three and one-half years, and although the treatment is apparently only palliative, the patients have been dramatically relieved of their headaches and most of them have been relieved of epileptic seizures.

The author goes on to state that it is rather difficult to attest the value of the various forms of treatment in these conditions because in most of the cases several forms of treatment have been adopted concomitantly. ADRIEN VERBRUGGHEN, M.D.

Eden, K., and Turner, J. W. A.: Loss of Consciousness in Different Types of Head Injury. *Proc. Roy. Soc. Med.*, Lond., 1941, 34: 685.

The question of loss of consciousness with injuries to the head is a matter which is now of primary importance to all surgeons, both in the army and those in civil practice. The particular group of cases studied in this article was 200 consecutive cases of head injury of all types admitted to one neurological center.

The matters of finer interest to the study were the loss of consciousness, retrograde amnesia, and post-traumatic amnesia. The types of head injuries in this particular series of 200 were as follows:

1.	Closed cerebral injury, with or without fracture (due to road accidents, heavy falls, and blows)	98
2.	Scalp wounds without fractures (due to blows or projectiles)	12
3.	Open cerebral injury (due to penetrating metal splinters)	
	(a) Superficial	27
	(b) Deep	14
4.	Compound fractures due to	
	(a) Massive violence—road accidents, falls, and heavy blows	15
	(b) Projectiles—fragments of bomb casing, and bullets	34

From the study of these cases the authors came to the conclusion that there were two possible effects on the brain from a blow to the head. The first was concussion, which resulted in an instantaneous but transient loss of consciousness, usually with retrograde amnesia, and unassociated with other signs of damage to the brain. The second, contusion, was characterized by localized signs of brain injury, blood staining of the cerebral fluid, and, in some cases only, unconsciousness, which might be delayed for several minutes or hours. Concussion occurred nearly always as a result of massive violence to the head. This usually took the form of a heavy fall in which the head struck a hard flat surface, such as the ground, or a blow to the head from a large missile at a relatively low velocity, such as a flying brick or a falling beam. If the violence was sufficient to overcome the normal elasticity of the skull, fracture of the skull resulted, which did not necessarily effect concussion. Small objects, however, which penetrated the skull, especially those traveling at high velocity, effected consciousness very little, and so usually did not result in concussion. From this the authors deduced the idea that a blow involving a large part of the skull caused concussion, whereas one involving a small localized part of the skull did not. Contusion, on the other hand, they regarded as occurring possibly in all types of head injuries. Massive violence to a large area of skull caused a widespread contusion to the brain with resulting unconsciousness. In some cases, however, small fragments striking with high velocity caused a very small area of contusion which extended with time. If, however, the metallic fragments traveling at high velocity penetrated deeply into the brain and were found deep down in the basal ganglia, consciousness was very much more likely to have been impaired. On some occasions also a massive blow to the head was secondary to a penetrating wound of the brain. For instance, an individual might have the head penetrated by a high velocity bullet and then receive a massive blow to the head by falling.

The study represents a careful analysis of these patients with regard, as was said before, to retrograde amnesia and post-traumatic amnesia. There are adequate tables and figures to show how many patients were affected and also whether they were affected in terms of seconds, minutes, hours, or days.

ADRIEN VERBRUGGHEN, M.D.

Coleman, C. C., and Thomson, J. L.: Extradural Hemorrhage in the Posterior Fossa. *Surgery*, 1941, 10: 985.

Extradural hemorrhage in the posterior fossa is a rare condition, and when it does occur it may be assumed that it is due to a tear in one of the several venous sinuses in the dura mater, since the arterial supply to the dura is very scanty. There is a relatively slow onset of symptoms in most cases, because the clot, forming slowly from a leak in the sinus where the pressure is never more than from 4 to 6 mm. of Hg, gives symptoms of ventricular obstruction rather than those of direct cerebellar pressure. In fact, the symptoms may require a matter of days before they become sufficiently definite for accurate diagnosis. Frequent neurological examinations must be made in order to observe the appearance and progression of the hypotonia, hyporeflexia, and drowsiness. These signs, together with the history of a blow on the back of the head, with later developing nuchal rigidity, headache, and restlessness, should indicate the presence of a clot placed extradurally in the posterior fossa. The pulse and respiration will eventually undergo serious change, and unless the patient is operated upon immediately and the clot can be completely evacuated, death is certain to occur.

The authors report 1 case of post-traumatic extradural clot of the posterior fossa recently treated successfully by them.

JOHN MARTIN, M.D.

Antoni, N.: Buerger's Disease, Thromboangiitis Obliterans, in the Brain. *Acta med. Scand.*, 1941, 108: 502.

Three cases of proved thromboangiitis obliterans of the brain are discussed. All of the patients were men, aged thirty-six, thirty-six, and forty-seven years. One had typical intermittent claudication with a poor pulse in the legs; neither of the others had a history nor any sign of disorder in the vessels of the extremities. None of the patients had pronounced cardiac symptoms. The neurological disorders in all 3 cases were predominantly of purely hemispherical type: monoplegia, hemiplegia, scotoma, hemianopsia, and aphasia. None showed any great resemblance to multiple sclerosis, but 1 showed a good deal of atrophy on encephalography. All of them showed evidence of mental deterioration, and all of the patients died with a fairly rapid clinical course after the onset of definite clinical symptoms.

It is suggested that this condition of the brain is, no doubt, more common than its actual recognition and proof has led us to believe. Recurring hemorrhages in the vitreous body and retinal periphlebitis in young persons are or may be manifestations of Buerger's disease, such patients often showing distinct signs of vasomotor and organic arterial changes in the extremities. Also, many patients showing fleeting paralysis of the cranial nerves, transient hemiparesis, and cerebellar syndromes, and with a recurrent or intermittent history indicating a possible multiple sclerosis, may actually be suffering repeated insults due to thrombosis of the cortical vessels. Recurrent epilepsies in the young may also be due, in some cases, to this disease. Several excellent photomicrographs illustrate the essential pathology of the cerebral vessels in the cases reported by the author.

JOHN MARTIN, M.D.

Klemme, R. M.: Oculogyric Crises. *Am. J. Ophth.*, 1941, 24: 1000.

When the operation of premotor cortical excision was done on 3 patients for the relief of paralysis agitans and athetosis, they were relieved of oculogyric crises, from which they were also suffering. Later Klemme found that typical oculogyric attacks could be produced by cortical faradic stimulation of the junction of the first and second frontal convolutions, adjacent to the anterior edge of the motor cortex. In 1940, premotor cortical excision was first performed for the express purpose of relieving oculogyric crises. In the case reported, the right motor cortex was outlined, and the upward spasmodic movements of the eyes were reproduced by faradic stimulation. A small area of premotor cortex was removed anterior to this center. The patient was relieved of her oculogyric crises.

DAVID J. IMPASTATO, M.D.

SPINAL CORD AND ITS COVERINGS

Friberg, S.: Low Back and Sciatic Pain Caused by Intervertebral-Disc Herniation. Anatomical and Clinical Investigations. *Acta chirurg. Scand.*, 1941, 85: Supp. 64.

A large volume of anatomical investigation into the mechanism of the production of ruptured disc was done by this author, and his results have been given in detail. Defects of different sizes were made in different parts of the annulus fibrosis in spines from persons between the ages of fourteen and sixty-eight years. Not one spontaneous herniation was produced, nor did as many as 500 forced movements under pressure lead to a herniation. These and other tests lead to the conclusion that during life it must be assumed that the nucleus pulposus has degenerated before it ruptures, unless the intervertebral disc has been submitted to unusual violence.

Comparative investigations on air and oil myelography were made, and while there was some correspondence between the results of these two methods, it was concluded that air myelography does not lead to definite conclusions to the same extent as does myelography with lipiodol. A simple, and, accord-

ing to the author, quite effective method for the removal of lipiodol through a spinal trocar is described in detail.

The symptoms which usually characterize prolapse of an intervertebral disc are:

1. Pain in the lumbosacral region, generally radiating into one leg or gluteal region. These pains are accentuated by straining, coughing, and sneezing.
2. Scoliosis of the lumbar spine. The spine is flattened and its mobility is restricted.
3. Positive Lasègue sign, stronger on the painful side.
4. Diminished sensibility over the outer surface of the leg, and possibly also of the thigh, on the painful side. There may also be some muscle atrophy.
5. Diminished or absent Achilles reflex on the painful side.
6. Increase in the total protein content of the spinal fluid.

Follow-up examinations were made on 25 patients after a postoperative period of observation of between twelve and twenty-seven months. The functional results were good. Eighty-four per cent of the patients, most of whom did heavy manual labor but had been incapable of working for a long time prior to the operation, were able to return to their old employment. The preoperative signs of neurological change showed no improvement in most patients in check-up examinations. The author thinks he sees a connection between this and the consistently long preoperative duration of symptoms, as a result of which the injury to the nerve elements probably became irreparable.

JOHN MARTIN, M.D.

PERIPHERAL NERVES

Wyburn-Mason, R.: Brachial Neuritis Occurring in Epidemic Form. *Lancet*, 1941, 241: 662.

The author saw 42 cases of brachial neuritis between December, 1940, and August, 1941. This unusual number of cases of a condition that is normally relatively rare, and its occurrence in the winter and spring suggest that it was due to an infection in epidemic form. Four typical cases are reported and a summary of the findings in 42 patients presented. The age incidence was between thirty and seventy-seven years, and the ratio of men to women 13:8. In 3 cases the condition was bilateral.

The clinical features suggested involvement of the anterior primary divisions of the spinal nerves from C_3 to D_1 in whole or in part. In most cases the upper part of the plexus and the skin segments served by C_5 and C_6 were most affected. The motor weakness was usually general and accompanied by atrophy in long-standing cases, but in some it was limited to one or two muscles, e.g., the serratus magnus and triceps. Every case began with pain, often burning, located in the scapular region. The effect on the tendon reflexes in the involved limb was variable. In 1 case there was associated an external popliteal nerve lesion. The author saw several cases of a similar condition confined to the external popliteal nerve.

The cause of this condition is unknown. Several possibilities, including a neurotropic virus, like herpes zoster, fibrositis, and allergic reaction to infection are briefly discussed. Whatever the etiology, the author believes this is a clinical entity, possibly the result of an infection which is appearing in this war for the first time.

JOHN L. LINDQUIST, M.D.

SURGERY OF THE THORAX

CHEST WALL AND BREAST

Altemeier, W. A., and Wadsworth, G. H.: Ileus Following Fractured Ribs. *Ann. Surg.*, 1942, 115: 32.

Reports of paralytic ileus following fractured ribs are rare. Five such case reports have been made to date. A study of 454 cases of fractured ribs seen at the Henry Ford Hospital during the past twenty-four years reveals only 10 cases of associated paralytic ileus. Only cases of fractured ribs uncomplicated by conditions known to produce ileus, such as pneumonia, fractured pelvis, or fractured vertebra, are included in this report.

An analysis of these cases shows that 80 per cent of the patients had one or more fractured ribs within 5 cm. of the lateral vertebral border. In 2 instances the head of the rib was badly comminuted. The average age of the patients was forty-six and eight-tenths years.

Irritation of the dorsal sympathetic ganglia and splanchnic nerves appears to be the most plausible explanation. This irritation may be accomplished by displacement of the head of the rib or a proximal fragment, retropleural edema or hematoma in the paravertebral area, or reflex stimulation of the splanchnics through the peripheral abdominal or thoracic nerves.

If the presence of a ruptured intra-abdominal viscus can be ruled out, this complication of paralytic ileus following fractured ribs is best treated conservatively without operation.

JOHN E. KIRKPATRICK, M.D.

Schenck, S. G.: Classification of Cancer of the Breast. *Am. J. Roentgenol.*, 1941, 46: 709.

The author presents a new clinical classification for carcinoma of the breast which he has found practical and serviceable in the treatment of more than 200 patients with cancer of the breast. Four stages of breast cancer are considered: Stage I, the early type, in which the tumor measures less than 3 cm. in its widest diameter, is movable, and there is no evidence of metastasis; Stage II, which includes moderately advanced cases with tumors measuring from 3 to 6 cm. in diameter, without metastasis or skin fixation; Stage III, the advanced group, which includes all other cases which have not been operated upon. Stage IV includes all postoperative cases. The physical status of the malignant breast itself is designated by capital A, the findings in the adjacent axilla by B, those in the supraclavicular fossa by C, those in the contralateral breast and its regional lymph glands by D, and those in the rest of the organs (distant metastasis) by E. Each of these groups is further subdivided; for example, under A there are three subgroups indicated by the arabic numerals 1, 2, and 3. Number 1 designates the widest diameter of the neoplasm; Number 2, the status of the skin of the breast; and Number 3 is reserved for those neoplasms that are definitely adherent to the underlying pectoral muscles and fascia. Numerals 1, 2, and 3 are further subdivided into Classes a, b, etc.

All cases falling into Stages I and II should be treated by radical surgery and irradiation; the outlook is good, especially in those of Stage I. Cases in Stages III and IV are primarily radiological problems, requiring high-voltage irradiation or radium, or both. Conservative surgery may be indicated in these cases, in which the five-year cure rates are low.

HAROLD C. OCHSNER, M.D.

O'Brien, F. W., and McDonald, E.: Irradiation in the Treatment of Cancer of the Breast. *New England J. Med.*, 1941, 225: 17.

The authors discuss the place of irradiation in the treatment of mammary cancer. The subject, of course, must include the various cancer states.

Irradiation alone in operable cases as the sole therapeutic measure is justifiable in patients who are poor surgical risks, borderline operable cases, and in specially organized clinics. Since 1922 Keynes has treated 390 selected cases of operable cancer of the breast with buried radium needles. He shows a five-year survival rate of 65.9 per cent. This is a highly individualized procedure.

The authors believe that if cases rigidly selected are designated "curable cancer" instead of "operable cancer" there will be less surgical intervention. They do not believe that irradiation to the exclusion of surgery should be employed in the group of patients with "curable cancer" who, when operated on radically, give a five-year cure rate (alive without disease) of 70 per cent or better, as reported by Simmons and his associates. Once the disease has extended to the axilla, the five-year cure rate by surgery drops to about 30 per cent.

Preoperative irradiation is suggested by the foregoing to complement surgery. Halley and Melnick have found that the mutation effects of preoperative radiation require four or five weeks, and that surgery done within three or four weeks of the end of irradiation has the advantage of dealing with tissues containing few viable tumor cells and with only a slight damage to the tumor bed. Thus optimum spacing of the irradiation dose may be the crux of the problem, as indicated in the work of Spear and Glucksmann.

Postoperative irradiation has been routinely abandoned in some clinics because of apparently paradoxical results. Much of the criticism leveled at therapy at this stage is caused by failure to apply the principle that only like things are comparable. In order to compare end-results it is necessary to know the extent of the disease, the degree of malignancy, the skill of the operator, the kind of operation

performed, and the use of supplemental measures such as radiation.

The authors do not believe that postoperative irradiation is necessary in those patients in whom the disease was localized in the breast by diagnostic roentgen-rays or operative and pathological examinations, with the exception of Grade III tumors, which are presumed to metastasize early. Roentgen-ray castration may be of value. In cases operated upon without previous knowledge of distant metastases, postoperative irradiation has shown benefit, 39 per cent of a series of patients so classified lived for more than five years.

It is not sufficient to treat the affected chest wall, axilla, and supraclavicular chain of lymphatics; one must treat the mediastinum and parasternal nodes, as well as the lymphatics of the opposite breast, over a protracted period.

Irradiation for local recurrences and distant metastases is often indicated when surgical excision is not feasible. Hicken has shown that secondary nodules in the scar or skin of the breast are due to faulty extirpation of the mammary gland from the reflected skin flaps.

Distant metastases may be one of several primary foci according to the estrogenic theory. Occasionally, generalized skeletal metastases have disappeared completely following irradiation of the ovaries.

Any such late therapy is palliative to be sure, but it is comparable in some measure with therapeusis in certain other chronic but fatal maladies common to the field of internal medicine.

Irradiation of inoperable tumor cases is hopeless, yet enough palliative benefit ensues to justify acceptance of such patients by the radiation therapist since a judicious combination of aid by the internist will help a few to live in comparative comfort for five years or longer.

In conclusion it is paramount to subscribe to the dictum that any surgeon who does less than a radical operation in curable breast cancer is not giving his patient even a sporting chance for recovery. Irradiation is complementary to surgery when indicated.

JOHN E. KIRKPATRICK, M.D.

TRACHEA, LUNGS, AND PLEURA

Paine, J. R., Lynn, D., and Keys, A.: Observations on the Effects of the Prolonged Administration of Highly Concentrated Oxygen to Dogs. *J. Thoracic Surg.*, 1941, 11: 151.

The scope and amount of medical use of oxygen continue to increase, and a part of this increase has been due to the development and application of the Boothby-Bulbulian mask. More recently oxygen therapy has been advocated and used for the relief of the distention in intestinal obstruction. This has not been without some danger since some cases of "oxygen poisoning," due to the administration of high concentrations, have been reported.

Experiments were designed, first, to determine the influence of oxygen administration on obstructed loops of bowel and, second, to study the general effects of oxygen therapy.

Four dogs with complete obstruction of the ileum were subjected to an atmosphere containing from 95 to 100 per cent of oxygen for a period of time up to fifty-two and one-half hours.

Four other dogs with complete obstruction of the sigmoid colon were treated likewise for as long as forty-eight and one-half hours.

In both groups a definite decrease in the amount of gas in the obstructed bowel was noted after oxygen therapy. Likewise, both groups exhibited an increase in oxygen content (from 5.8 per cent to 22 per cent) and a decrease in carbon-dioxide content (from 15 per cent to 2 per cent) of the intestinal gas up to the end of a period of twenty-five hours. After this length of time there was a gradual reversal toward original values.

Another group, consisting of 49 dogs, was subjected to atmospheres containing from 75 to 100 per cent oxygen, and its effect on the organs and tissues in general was observed. The lungs, liver, and kidneys routinely exhibited hyperemia and congestion. The lungs also showed much edema, and as little as two hours of exposure to 100 per cent oxygen was sufficient to produce definite pathological alterations.

Although a marked individual variability to withstand the exposure was noted, with from 95 to 100 per cent oxygen death occurred, on the average, by the end of thirty-nine hours.

Other changes noted included contraction of the spleen, pleural effusion, and distention of the stomach with gas. The intestines were collapsed.

WILLIAM E. ADAMS, M.D.

Carvalho Ferreira, J., and Jouval, H.: Therapeutic Pneumothorax in Children Up To Fourteen Years of Age and in Adults More Than Forty Years of Age (Pneumotorax terapeutico em crianças até 14 anos e em adultos de mais de 40 anos). *Folha med.*, 1941, 22: 255.

The majority of cases of tuberculosis occur in persons from fifteen to forty years of age and as a result the study of the effects of pneumothorax has been limited chiefly to patients within these age limits.

The authors, however, have made a study of this method of treatment in children up to fourteen years of age and in adults past 40, based on the material they have treated in the decade from 1930 to 1940.

They have practiced pneumothorax in 22 children from seven to fourteen years of age, 6 males and 16 females. The tuberculosis was bilateral in half of the cases. They have only recently been admitting children from infancy to seven years of age and these cases will have to be reported later. The most frequent complication was adhesions, which were seen in 81.81 per cent of the cases. There were 5 cases of mediastinal hernia, or 22.72 per cent, which is higher than the 17.04 per cent in adults over forty. Except in the early cases of positive pressure, negative pressure was used and in the latter group there were fewer cases complicated by pleural exudate.

The results were good in 31.81 per cent of the cases, in 31.8 per cent the condition remained stationary, and in 36.36 per cent the condition was aggravated.

The cases in adults were divided into three groups, the first including 86 patients from forty to forty-nine years of age, the second 21 patients from fifty to fifty-nine, and the third 5 patients from sixty to sixty-nine. In the first group there were cures in 12.79 per cent and improvements in 12.79 per cent, or a total of good results amounting to 25.58 per cent. In the latter two groups there were no cures in the strict sense of the word but there was improvement in 23 per cent and 40 per cent, respectively.

The authors conclude that the use of this treatment is justified at any age.

AUDREY G. MORGAN, M.D.

Overholt, R. H.: Permanent Collapse Therapy in Pulmonary Tuberculosis. *J. Am. M. Ass.*, 1941, 117: 1681.

Since there is an increase in thoracoplasty, it is desirable that members of the profession be familiar with the changes in the thorax which are brought about by this procedure. Great reliance is placed on fluoroscopy and on serial roentgenograms in following the progress of the arrested disease.

Patients who suffer from advanced disease with irreparable pulmonary damage belong in the category of those who can best be helped by permanent collapse therapy as produced by thoracoplasty.

The author believes that modern thoracoplasty will accomplish the following:

1. Fibrous tissue is released, which permits cavity closure.

2. Pulmonary tissue which has been partially damaged but not destroyed totally, and of which the elasticity has been impaired by fibrosis is relaxed.

3. Limitation of motion is imposed on the diseased lung.

4. The collapse of the disease can be made highly selective with conservation of healthy portions of the lung.

5. Disturbances due to distortion of the thoracic viscera, such as upward displacement of the lower lobe and lateral displacement of the heart and great vessels, are corrected.

6. The thoracic volume is so adjusted that it comes to equal the volume of the healthy lung.

7. The risk of the development of tuberculosis or mixed empyema in an artificially maintained air space is eliminated.

8. The risk of spontaneous pneumothorax on the side of treatment is greatly lessened.

Final conclusions as to the ultimate fate of patients treated by thoracoplasty must be deferred until more time has elaspsed, although, in the future, this procedure may be looked upon as the most conservative type of treatment. A preliminary survey limited to patients treated successfully by thoracoplasty, who completed the recommended postoperative regime and were discharged with the consent of their medical advisors, has been made. The great majority of the patients had been in for a check-up examination within the past six months. The results of the author's study are given. The question of permanent collapse, from the standpoint of the patient, is answered in a questionnaire sent out to the patient.

Several refinements of modern thoracoplasty have contributed to its successful application in tuberculosis therapy. Such refinements are described in detail.

The risk of operation and extent of the procedure are given as well as supplementary procedures.

In conclusion, the author believes that when spontaneous adjustments of the thoracic viscera have not resulted in healing, or obviously cannot bring it about, collapse thoracoplasty is indicated, and when temporary measures fail or cannot be maintained with safety, thoracoplasty should be considered. Refinements of modern thoracoplasty that have materially added to its effectiveness include lung palpation at operation, specific mobilization, the liberation of anchoring structures over areas of disease, the preservation of periosteal elements, and subtotal scapulectomy to minimize the deformity in partial thoracoplasty.

Five years or more later, 94 per cent of the patients were alive and the disease was arrested; 91 per cent considered themselves well, and 83 per cent were working.

EMIL C. ROBITSHEK, M.D.

Schenck, H. P., Leopold, S. S., Pendergrass, E. P., Johnson, J., and Tucker, G.: Symposium on Bronchiectasis. Etiology; Medical Aspects; Roentgenological Considerations; Surgical Treatment; Bronchoscopic Aspects. *Arch. Otolaryngol.*, 1941, 34: 958–999.

HARRY P. SCHENCK. The relationship of bronchiectasis to sinus disease has long been under discussion. Experimental evidence has been in support of the theory that bronchiectasis is secondary to sinus infection. The infection may extend to the lung by the way of the air passages, the lymphatic system, or indirectly through the contiguous sub mucosal lymphoid structures, thence by inhalation of secretions. The author presents illustrative evidence of experiments showing that the infection from the lungs may be extended to the sinuses through the effect of coughing. Iodized oil was used and x-rays were made showing its expulsion from the lung to the sinuses. The author raises the question of whether a weakened cough is not at fault in the production of bronchiectasis and believes that sinus disease and bronchiectasis should receive treatment simultaneously.

S. S. LEOPOLD. The author divided bronchiectasis into the following groups, namely, congenital, atelectatic, dry bronchiectasis, and acquired bronchiectasis. He calls attention to the frequency of sinus disease in bronchiectasis and recalls the observation made by Graham in a patient with a bronchial fistula. The mucosa of the fistula became

red and swollen and discharged pus with each attack of upper respiration infection. The author believes that congenital bronchiectasis and cystic disease of the lung are related. Acquired bronchiectasis frequently follows an attack of measles, whooping cough, or pneumonia, and appears to be definitely related to the development of bronchial obstruction. He calls attention to the fact that bronchiectasis is much more common in the left than in the right lung and believes this is due to the fact that the left drains less easily than the right.

E. P. PENDERGRASS. An excellent review of the normal anatomy of all intrathoracic structures from the standpoint of x-ray examination is presented. A description of various changes caused by respiratory movements is given. With the normal as a basis for comparison, changes brought about by bronchiectasis as demonstrated by bronchography are discussed in the following manner: (1) from the standpoint of location and extent of the disease, (2) structure of the bronchial tree, (3) condition of the flexible elements, (4) degree of fixation, and (5) time required for the lung to drain. The author believes that all cases of suspected bronchiectasis should be submitted to the procedure of bronchography early, in order that a diagnosis may be made before a late stage in the disease is reached.

J. JOHNSON. Bronchiectasis is a surgical disease. If left alone it eventually carries a high mortality, and in the moderate or well advanced stage it cannot be cured permanently by any conservative form of therapy; radical surgical treatment offers a reasonable chance of complete and permanent cure. An abundance of clinical evidence shows that on the whole, patients with bronchiectasis die young although many live for ten years or more before succumbing to the complications of the disease. These include pneumonia, lung abscess, bronchial fistula, and empyema.

The bronchial wall is destroyed by infection with regeneration of only the bronchial epithelium. The bronchi become dilated and saccular and pulmonary tissue is replaced by fibrous tissue. Thus the pathological changes are irreversible and a permanent cure can be obtained only by removal of the diseased lung tissue. The treatment of bronchiectasis must include a careful selection of patients. For this a complete diagnosis must be made in order to determine the extent of the disease process. When the condition involves both lungs, bilateral operations may be performed, but they carry an added risk.

Preoperative preparation of the patient is important and includes postural drainage, bronchoscopic aspiration, and chemotherapy with sulfanilamide. The operative technique has been markedly improved since 1929 when Sauerbruch's mortality was around 34 per cent. The early technique included mass ligation of the hilar structures, whereas at the present time individual ligation is advisable, and when not possible multiple sutures are used. Postoperative drainage of the pleural space is important, with negative pressure of from 5 to 10 cm. of water. Prevention of postoperative collapse and pneumonia by effective elimination of secretions is carried out by bronchoscopic aspiration and postural drainage.

When the disease is unilateral the mortality is comparable to that of other types of major surgical operations, and it should be nil except for an occasional surgical accident. A greater risk is present when bilateral operations are done. The author reports 12 cases, 6 of which required a total pneumonectomy and 6 a lobectomy, there were no deaths.

G. TUCKER. Much remains to be learned about bronchiectasis and the author believes bronchoscopic examination is one of the more important methods for its investigation. The role played by bronchial obstruction in the etiology of the condition as well as the prevention of the condition by the removal of the obstruction is strongly emphasized. The production of a "selective cough" at the time of bronchoscopy is thought to be especially valuable in the elimination of obstructing plugs of mucus in the bronchi.

Several cases of bronchial obstruction due to secretions in a "drowned lung" or unresolved pneumonia are presented with illustrative material showing the results of bronchoscopic removal of the obstruction. Studies with iodized oil illustrate the results of this treatment. The value of pneumonography in the complete diagnosis and bronchoscopic treatment of the condition, as well as its aid to the surgeon in determining the course of management of bronchiectasis is indicated. Chemotherapy is mentioned as of possible value but as yet has received insufficient investigation.

WILLIAM E. ADAMS, M.D.

Allbritten, F. F., Jr., Flick, J. B., and Gibbon, J. H., Jr.: The Use of Sulfanilamide in Partial and Total Resection of the Lung. *J. Thoracic Surg.*, 1941, 11: 187.

Although it has been known since 1935 that sulfanilamide would protect mice against the hemolytic streptococcus, the mechanism of its action has as yet not been determined. In the presence of peptone, pus, and necrotic tissue, a greater concentration of the drug is necessary for its effectiveness due to the presence of "inhibitor substances." Thus its local application under certain conditions has a rational basis.

Infection of the pleural space following resection of the lung for pulmonary suppurative disease is a common complication. An attempt to reduce its incidence by the administration of sulfanilamide was carried out in a series of 12 lobectomies, a previous series of 19 patients without use of the drug serving as a control. Sulfanilamide was generally given the day preceding the operation in sufficient dosage to produce a therapeutic blood concentration, and administration was continued following operation until pleural infection occurred, or the danger of its occurrence had passed. Of the 19 control operations,

18 were complicated by empyema, whereas of the 10 patients (12 operations) surviving the operation more than twelve hours and who received sulfanilamide, only 8 developed an empyema, the 4 others showing no evidence of infection.

The author points out that the method of stump closure may have been an additional factor. In the control series (19 patients) closure was made by mass ligation. In the treated series, 6 patients received individual ligation technique, with empyema in 4. The remaining 6 were treated by mass ligation, 4 of whom likewise developed an empyema. Five pneumonectomies, 1 for lung abscess and 4 for neoplasm, were also made, with sulfanilamide as a prophylaxis against infection. However, 4 of the 5 patients developed an empyema.

Of the 17 patients receiving sulfanilamide systemically, 10 also received a local application of from 4 to 8 gm. at the site of resection. Four of the 7 who had no local application of the drug developed an empyema. Although a much higher concentration of the drug was found in the pleural cavity following its local application, this was only a temporary condition because of the rapid development of fluid. Since closed drainage of the pleural space following lobectomy is desirable, the value of local application of the drug is at least partially lost.

WILLIAM E. ADAMS, M.D.

Kent, E. M., and Graham, E. A.: Experimental Observations on the Use of Drugs of the Sulfonamide Group in the Pleural Space. *J. Thoracic Surg.*, 1941, 11: 198.

Deliberate contamination of the pleural cavities of dogs with pus of a mixed flora resulted in a fatal empyema in every instance. On the other hand, identical contamination of the pleural cavities in other dogs failed to result in an empyema when simultaneously various members of the sulfonamide group of drugs were applied locally. There was no apparent superiority of any one drug over the others, and the use of any single member of the group appeared to be as effective as a combination of all four (sulfanilamide, sulfapyridine, sulfathiazole, and sulfanilylguanidine). The dosages of the drugs were admittedly relatively great, and it might be profitable to pursue similar studies with gradually decreasing amounts of these chemicals.

Such satisfactory results have not attended the clinical use of similar procedures and the explanation seems to be that these experiments are not comparable with the conditions present after pulmonary resection for suppurative disease. There is certainly a different problem when a continued source of infection is present, such as from a leaking bronchial stump or from a mass of devitalized, infected tissue.

These results may not be interpreted to indicate that local sulfonamide therapy will be efficacious in combating an established empyema thoracis. They do indicate, however, that such measures should be effective in the control of infection after intrathoracic procedures which do not provide a continued source of contamination following the operation.

It may be of interest to add that the wounds of each experimental animal healed per primam. Small amounts of the drugs were sprinkled on the wound surfaces when the experiments were made, and it seems reasonable to attribute, in part at least, the absence of wound infection to these chemicals.

J. M. MORA, M.D.

Burford, T. H., and Graham, E. A.: The Local Use of Sulfanilamide in the Pleural Cavity. *J. Thoracic Surg.*, 1941, 11: 203.

Sulfanilamide crystals were placed locally in 23 major cases of thoracic conditions, including 4 total pneumonectomies, 16 lobectomies, 2 mediastinal conditions, and 1 lingulectomy. Blood concentrations reveal the striking efficiency of the pleura as an absorptive mechanism. Levels as high as 16.6 mgm. per cent were obtained, the peak being reached during the first twenty-four hours. After this the level fell off rapidly. The concentrations found in the pleural fluid were all above 200 mgm. per cent during the first twenty-four hours.

The authors believe that the implantation of sulfanilamide crystals into the pleura after intrathoracic operations will not prevent or even minimize a putrid empyema if the bronchus opens. When contamination at the time of operation is rather gross but the bronchus may be reasonably expected to remain closed, the drug very likely has value in preventing an empyema. Thus far Burford and Graham had no ill effects from the administration of the drug, which was implanted in amounts as high as 15 gm.

J. M. MORA, M.D.

HEART AND PERICARDIUM

Schrire, T.: Stab Wounds of the Heart and Pericardium. *Lancet*, 1941, 241: 638.

The clinical records of 4 patients suffering from the following stab wounds are reported: (1) wound of the surface of the left ventricle; (2) penetrating wound of the right ventricle; (3) wound of the pericardium and pleura—cardiac tamponade; and (4) thoracoabdominal wound penetrating the right ventricle. The first of these patients died; the other 3 recovered completely and returned to work.

Every case was explored along the track of the wound. The original skin incision was excised and the wounded interspace widely opened; a view of the damage was then obtained, regardless of the chest-wall structures. Ribs were sectioned with shears; costal cartilages were divided with a knife and, except in Case 1, interspaces were cut across between two ligatures which transfixed and tied the neurovascular bundles. The importance of this last procedure is measured by the fact that the only death in the series (Case 1) was due to a leaking intercostal vessel.

In order to suture the penetrating heart wounds in Cases 2 and 4 it was necessary to steady the heart.

In Case 2, a finger was placed in the hole in the heart (Elkin's maneuver, 1936). In Case 4, in which the stab pierced the phrenic surface of the right ventricle, a suture was passed through the fibrofatty tissue at the apex and used as a tractor to lift the heart (Beck 1926). The chest was closed quickly by bringing the ribs together with pericostal sutures. Intercostal muscles were disregarded but parietal layers were carefully closed.

Separate drainage of the pericardium invites ascending infection. It is better to leave the pericardium opening widely into the pleural cavity and to drain the pleura with a large self-retaining catheter passed into the chest through a cannula; the end of the catheter dips under water. It is possible to receive a wound of the heart without penetration of the pleura (Elkin and Phillips, 1931), but even in such cases it would usually be necessary to open the left pleura in order to get sufficient exposure; so pleural drainage would entail little extra structural damage. If Case 2 had been drained, the patient might have been saved many tappings and an exploratory thoracotomy. In Case 3 the adhesions appear to have prevented satisfactory pericardiopleural drainage.

Search of the literature has shown only 10 cases of thoracoabdominocardiac wounds with 2 recoveries, both recorded by Pool (1912). Case 4 is a third instance of recovery after this rare lesion.

SAMUEL H. KLEIN, M.D.

Adams, R., and Polderman, H.: Suppurative Pericarditis. *New England J. Med.*, 1941, 225: 897.

Adams and Polderman believe that the advances of recent years require a re-evaluation of concepts in relation to suppurative pericarditis, and advise revision of its therapeutic program. They decry the "can do nothing" pessimism as expressed by Cabot, and ascribe to the operative principle sponsored by Winslow and Shipley, who report cures in 50 per cent of the cases treated with operation.

The article gives a summary of the 20 cases of suppurative pericarditis treated in the Massachusetts General Hospital during the past ten years. Included in this number is a detailed report of the management of 1 of their own cases, a five-year-old boy suffering from bronchopneumonia and pericarditis. The boy's recovery was attributed to early surgical drainage of the pericardial cavity, multiple blood transfusions, and the administration of sulfapyridine and antipneumonococcus serum in sufficient quantities to maintain a positive Francis test.

The authors ascribe the high mortality of the disease to the fact that it is itself a complication of preexisting infection elsewhere in the body. Added to this is the difficulty and delay in diagnosis. They maintain, however, that a favorable outcome is enhanced by early treatment; therefore early diagnosis is necessary, and the only completely effective therapy includes surgical drainage.

Pericardiotomy, however, should be recognized as merely an incident in the therapeutic program. The recently introduced seriological and chemotherapeutic agents must be considered important and valuable adjuncts. Adams and Polderman feel that the recovery of their own patients would have failed without these aids.

STEPHEN A. ZIEMAN, M.D.

ESOPHAGUS AND MEDIASTINUM

Moersch, H. J.: Further Studies on the Treatment of Esophageal Varices by Injection of a Sclerosing Solution. *Ann. Otol., Rhinol. & Laryngol.*, 1941, 50: 1233.

The treatment of esophageal varices by the injection of a sclerosing solution into the veins through an esophagoscope has been a source of considerable interest to esophagologists. Last year the author reported his initial experience with this form of treatment. Since then he has treated 10 additional patients suffering from varices of the esophagus. The author reviews briefly some of the mechanism involved in the production of esophageal varices, and describes the method of treatment.

Theoretically, the purpose of injecting a sclerosing solution into esophageal varices is to block the free passage of blood through the esophageal veins. By doing so, one hopes to stimulate the portal circulation to increase its efficiency in conveying blood back through the liver to the systemic circulation in a normal manner. Of probably even greater importance is the stimulation of new anastomotic channels to convey the blood from the portal to the systemic circulation by such a route that the communication will not be subjected to trauma as occurs in the esophagus.

The diagnosis of esophageal varices all too often is made only at the postmortem table. The condition should be suspected in any case in which there is a history of unexplained massive gastrointestinal bleeding. Careful roentgenographic examination of the esophagus usually will reveal the presence of varices. Occasionally, the diagnosis can be made only on esophagoscopic examination, as was true in one of the 11 cases reported herein. Esophageal varices as seen through the esophagoscope present a characteristic picture. The varices appear as tortuous, often nodular, light bluish prominences which protrude into the esophageal lumen. They are easily compressible and change in shape with peristalsis of the esophagus. They tend to run in a longitudinal plane, and may be so large and numerous that they occupy the entire esophageal lumen, producing dilatation of the esophagus.

The 11 cases in which Moersch treated patients for esophageal varices by injection of a sclerosing solution were divided for purposes of study into three groups. The first group comprised those cases in which splenectomy was performed, with or without omentopexy or ligation of the coronary vein, before injection with a sclerosing solution was undertaken. The second group consisted of cases of esophageal varices in which attempt at surgical relief had not been made. The third group comprised cases of

esophageal varices in which treatment by injection of a sclerosing solution was given first and splenectomy was done subsequently. In each case, the major complaint was that of gastrointestinal hemorrhage.

Sufficient time has not elapsed to determine with accuracy the efficacy of the injection type of treatment of esophageal varices. Time undoubtedly will bring about modifications of the present technique and may even prove the procedure to be useless. For the present, the author's experience has been encouraging, and the patients, for an unknown reason, state that their general health has been improved since the treatment was instituted.

Garlock, J. H.: The Present Status of the Surgical Treatment of Carcinoma of the Thoracic Esophagus. *Am. J. Surg.*, 1941, 54: 262.

Garlock has operated on 54 patients with carcinoma of the esophagus and cardia. Of 30 squamous-cell carcinomas of the esophagus, 19 were operable and resection was carried out. The operative mortality was 42 per cent. In 13, the Torek operation was done with a mortality rate of 46 per cent and only 2 patients are alive, 1 nearly five years and 1 thirteen months. In 6 patients, resection and anastomosis were done with a mortality rate of 33.3 per cent. The remaining 4 patients are alive, 1 two and a half years, 1 two years, 1 eight months, and 1 five months.

There were 24 cases of adenocarcinoma of the cardia with esophageal involvement. Nine were operable. The operative mortality was 44.4 per cent. Four patients are alive, 1 sixteen months, 1 fifteen months, 1 six months, and 1 five months. In this group, resection followed by esophagogastrostomy was the operation of choice.

Garlock is of the opinion that with improving operative technique, increasing operative experience, and earlier diagnosis the operative treatment of cancer of the esophagus will definitely improve.

JULIAN A. MOORE, M.D.

SURGERY OF THE ABDOMEN

ABDOMINAL WALL AND PERITONEUM

Lipsett, P. J.: Torsion of the Great Omentum. *Ann. Surg.*, 1941, 114: 1026.

Two cases of torsion of the great omentum are reported and 16 cases in the literature are reviewed. Although the occurrence has been recognized for a long time as a rare clinical entity, a diagnosis of the condition has seldom been made before operation. Most cases of torsion are associated with hernia. A certain number, however, are caused by inflammatory foci within the abdominal cavity which produce an inflammation in the neighboring omentum by contiguity. This may be true in cases of mild or subsiding appendicitis or cholecystitis in which the original focus subsides but the changes induced in the omentum persist. Omentum which is contained in a hernial sac may eventually become constricted or twisted in the neck of the hernia which results in a thickening and scarring of the omentum and produces a pathological locus in this organ. According to Morris, the right side is more often affected because this is the seat of more frequent pathological processes, such as appendicitis, cholecystitis, and gastric and duodenal ulcers.

With more frequent and earlier attention to hernia there has been a diminution in the occurrence of torsion of the omentum within hernial sacs. The differential diagnosis of acute torsion of the omentum, either hernial or idiopathic, is difficult. Almost every variety of acute intra-abdominal disease has been mistaken for torsion. The sudden onset of pain on the right side of the abdomen was a constant finding in one series.

The author makes a plea that the surgeon obtain more complete data in the idiopathic type of torsion by observing peculiarities in the anatomy of the omentum which might favor torsion; as well as the hernial openings, intra-abdominal foci, and inflammatory foci—acute, chronic, or healed—which might explain initial changes in the omentum. Surgery is the only treatment and recovery is the rule.

HAROLD LAUFMAN, M.D.

GASTROINTESTINAL TRACT

Nicol, B. M.: Geographical Distribution of Gastric and Duodenal Ulcers in the British Isles. *Brit. M. J.*, 1941, 2: 780.

The relative incidence of duodenal and gastric ulcers in hospital patients varies throughout Britain, from 1 to 1 in London to from 8 to 1 in Scotland.

London is the only big city in the world in which an equal number of duodenal and gastric-ulcer patients are treated in the hospital. There are two possible explanations of the London figures: (1) that the population of London has dietetic habits that differ from those of the populations of other cities; or (2) that the percentage of patients in London suffering from duodenal ulcer, who are treated as in-patients in the hospital and not as out-patients or as private patients in their homes by general practitioners, is less than in other cities all over the world.

Since the figures for the incidence of duodenal ulcers and gastric ulcers in London differ so materially from those available from other large cities all over the world, it is suggested that the second explanation given is the correct one.

In Britain, it appears that gastric ulcer is less common in the north than in the south, and, in particular, London seems to have a very high proportion of gastric ulcers.

The sex incidence of peptic ulceration is remarkably constant throughout the world, being approximately 3 males to 1 female.

The age of onset of symptoms in the majority of cases of duodenal ulcer is between twenty and thirty years. In gastric ulcer the curve for the age of onset is spread uniformly throughout life between the third and sixth decades, the incidence being distributed evenly and without the marked peak between the ages of twenty and thirty years as seen in duodenal ulcer.

In cases of duodenal ulcer, the family history has shown peptic ulceration more than twice as often as in cases of gastric ulcer.

The factors most often associated with the onset or relapse of symptoms are worry and dietetic errors. There is a marked difference in the incidence of gastric and duodenal ulcers due to these two factors. Mental strain is more commonly associated with the onset or relapse of duodenal ulcers; physical factors, acting mainly through irritation of the gastric mucous membrane, are more frequently associated with the onset of gastric ulcers. Worry or overwork often leads to faulty dietetic habits, and many nervous or irritable patients blame dyspepsia as the cause of their irritability.

In view of (1) the variation in relative incidence of duodenal ulcer and gastric ulcer in Britain and throughout the world, and (2) the differences noted in the etiology of the two forms of ulcer, the following hypothesis is advanced:

Two different sets of factors are at work in the causation of peptic ulceration. These can be called "D" factors, those leading to duodenal ulcer, and "G" factors, those resulting in gastric ulcer. The "D" factors are usually inherited, but may be aggravated or even originated by mental stress and anxiety. They are active most frequently in the third decade of life, and appear to be psychophysiological in character. The "G" factors, on the other hand, are not inherited, occur throughout life more or less uniformly from the second to the sixth decade, and lead to local trauma of the gastric mucosa. The sum of the "D" and "G" factors causes peptic ulcer-

ation approximately three times as often in males as in females. JOSEPH K. NARAT, M.D.

Seley, G. P., and Colp, R.: The Bacteriology of Peptic Ulcers and Gastric Malignancies; Possible Bearing on Complications Following Gastric Surgery. *Surgery*, 1941, 10: 369.

Emphasis is placed upon the large percentage of deaths in gastric operations due to peritonitis. The wide variety of organisms found in the stomach has been reported upon in the past and the greatest number of organisms was found in stomachs which were the seat of carcinoma. No special organisms were regularly responsible for the peritonitis.

In the present study cultures were made of portions of serosa, mucosa, and lymph nodes, when possible. The cultures usually represented the organisms found in the lesion. The specimens were triturated and planted on various media and incubated under aerobic and anaerobic conditions. Identification of the bacillus welchii, staphylococcus aureus, staphylococcus albus, and streptococcus was completed satisfactorily by extensive studies. All strains of the streptococcus hemolyticus were found to be of Lancefield's Type A which is pathogenic for man.

In this study of 69 cases the following presumably pathogenic organisms found are listed in the order of their frequency: streptococcus viridans, streptococcus hemolyticus, streptococcus anhemolyticus, bacillus coli, bacillus welchii and other organisms. Positive cultures were found in 93.7 per cent of the gastric malignancies, 83.3 per cent of the gastric ulcers, 36.6 per cent of the duodenal ulcers and 37.97 per cent of the secondary or complicated peptic ulcers. Presumably pathogenic micro-organisms were recovered in 88 per cent of the malignancies and 30 per cent of the cases of benign ulcer. In 25 per cent of the 24 lymph nodes cultured, pathogenic micro-organisms were found. The specimens of serosa yielded positive pathogenic cultures in 15 per cent of the cases. Of 16 cases in which the perigastric fat was cultured 31 per cent contained pathogenic micro-organisms.

Cultures of the gastric contents obtained through Levine tubes in 62 patients showed that the bacillus coli was obtained 42 times and the enterococcus 29 times, in addition to numerous other organisms. Throat and stomach cultures taken in 41 cases over a period of two years showed that in only 3 cases was the hemolytic streptococcus found in the throat and stomach of the same individual. Twelve patients had the hemolytic streptococcus in the throat.

The height of the free acid curve was not the most important factor in reducing the pathogenic flora, since many organisms were present in 50 per cent of the cases of gastric ulcer in which the acid was high. The percentage was high in cases of gastric carcinoma when the acid figures were low. Thus gastric lavage is beneficial as a prophylactic measure.

Clinical correlation with the bacteriological findings revealed a greater incidence of wound and intra-abdominal infections in those cases in which positive cultures were obtained at operation. The presence of the streptococcus viridans and bacillus welchii, the streptococcus hemolyticus, bacillus coli, and streptococcus nonhemolyticus was significant, occurring alone or in combination in 9 of 12 (75 per cent) patients with wound infections, in 12 of 16 (75 per cent) with intra-abdominal complications, in 10 of 15 (66.6 per cent) of the deceased patients, and in only 6 of 16 (37.5 per cent) patients with pulmonary complications. In 3 of 8 patients with cultured wound infections there was marked similarity between the stomach and the wound cultures.

Of the 15 fatal cases 8 (53 per cent) were due to intraperitoneal infections, 3 with the bacillus welchii and 5, with the streptococcus viridans. In 5 deceased patients in whom death could not be ascribed to peritonitis the bacillus welchii was found in cultures other than those found at operation (1 culture from abdominal puncture after operation, 1 at post mortem, 1 after stomach lavage, and 2 from wound infections). In the 7 cases wherein the bacillus welchii was present the morbidity and mortality rates were higher. Every patient with a positive bacillus welchii culture at operation exhibited some complication. The ischemic inverted tissue at suture lines forms a good culture medium, and dehiscence occurred at the duodenal stump and enterostomy suture lines with subsequent complications. This is apparently the first time the bacillus welchii has been reported as cultured from the stomach and duodenum.

The authors conclude by advising (1) greater care in technique to avoid contamination with the use of an "aseptic" technique; (2) treatment of nodes and perigastric tissue as potentially infective; (3) drainage of the peritoneal cavity by means of a lateral stab wound, (4) the use of bacillus-welchii antitoxin, and (5) the use of sulfanilamide, although this drug was not employed in these cases.

HENRY P. ROYSTER, M.D.

Eusterman, G. B.: Carcinomatous Ulcer. *J. Am. M. Ass.*, 1942, 118: 1.

Small ulcerating forms of gastric carcinoma may not only be clinically indistinguishable at times from chronic benign ulcer but may respond to medical treatment so favorably as to give a wrong impression of their true nature. Such response seems especially characteristic of carcinoma *in situ*.

The author has included a report of cases demonstrating that although a carcinomatous form of ulcer may undergo little objective change, if any, while under treatment, the improvement at other times, especially during the earlier stages of the lesion can be so striking as to be misleading.

The real and apparent favorable reactions to treatment of early carcinomatous ulcers are attributed, respectively, to the effect of such treatment on secondary peptic ulceration of cancerous tissue and to the filling in of the base of the ulcer with the latter.

The rate and extent of healing of an ulcerous gastric lesion undergoing adequate treatment are of primary importance in the differential diagnosis. However, all treated patients should be submitted to periodic re-examination irrespective of how favorable the response. Such follow-up is particularly imperative in the presence of lesions with certain clinical features which have been discussed.

Walters, W., Gray, H. K., and Priestley, J. T.: Malignant Lesions of the Stomach. *J. Am. M. Ass.*, 1941, 117: 1675.

Partial gastrectomy affords an excellent means of treatment of cancer of the stomach with successful cures in a large percentage of cases in which there are localized lesions, regardless of their degree of malignancy, and in a smaller group of those in which metastasis has been demonstrated. After patients on whom resection has been performed have survived a five-year period the survival rate closely approximates that of the general population of similar age groups. The risk of this surgical procedure has been comparatively low considering the fatal nature of the lesion unless it is removed. The mortality rate has decreased progressively in recent years as a result of the advances made in the preparation of patients before operation and the treatment of such postoperative complications as infection, both local and general, pneumonia, atelectasis, and pulmonary embolism.

In cases in which there is persistent dyspepsia, no matter of what type, roentgenographic, and when necessary, supplementary gastroscopic examinations are accurate methods of determining the presence of an intragastric lesion. Medical treatment of an ulcer type of dyspepsia should not be instituted unless a roentgenological exmination is made to determine the exact location and nature of the lesion.

Donaldson, J. K., Sive, E. B., and Lewis, N.: Intestinal Obstruction. *Arch. Surg.*, 1941, 43: 811.

The greatest mass of evidence available at present indicates that there are two fundamental "chief concerns" in any given case of acute intestinal obstruction: first, loss of fluids and electrolytes; second, interference with the blood supply. The problem of replacement therapy has been rather well solved with regard to acute obstructions, so that the most serious primary concern in any case is usually the interference with the blood supply. This interference may come by direct obstruction of the mesenteric vessels to an intestinal segment as in strangulating volvulus or in mesenteric thrombosis, or it may result from bowel distention. Wangensteen has warned that decompression therapy has not solved the entire problem of the interference with the blood supply.

The authors in their experimental work have endeavored to obtain as pure products of degeneration as possible from the wall of the small bowel of dogs at an early hour after the ligation of the blood supply to the selected loop. They used small animals for injection of the products of degeneration. Control studies were established to demonstrate the relative nontoxicity of secretions from the clean wall of the nonstrangulated intestine. It was necessary to determine whether bacteria are essential to the production of any toxin found. The chemical nature of the toxins was also studied.

The thin, untreated, nonsterile, fresh, normal ileac secretion from dogs is not lethal to mice when injected intraperitoneally in doses of 8 minims, provided the bacterial content of the fluid is low (below 8 and 10 bacteria per oil immersion field). The sterile filtrate of loop fluid from the walls of degenerating ilea of dogs becomes lethal to mice in two and one-half hours or less after strangulation of the arterial blood supply to the loops.

The principal toxic substances injected intraperitoneally into mice in minimum lethal doses gave a consistently characteristic reaction, i.e., lethargy and evident general depression, with death occurring twenty-four hours or less after the injection.

Two fractions from the principal substances giving the toxic reactions just described and each of the toxic substances gave the same type of depressive reaction in mice. One fraction was water soluble, coagulated or destroyed by heat, and contained roughly 85 per cent of the total toxicity of the whole of the fresh substance obtained from the strangulated intestinal wall. The second toxic substance was water soluble and thermostable. Another toxic substance is soluble in alcohol and water. This fraction is thermostable, is produced in small quantities, and produces rapidly fatal results following mouse injection. Death occurs in from one to five minutes after injection and is preceded by excitement, muscle spasm and rigidity, and apparent asphyxia, a reaction very similar to, if not identical with, that produced by histamine. Practically all the toxic substances isolated were produced in the presence of bacteria. Polyvalent bacillus-perfringens antitoxin does not neutralize the toxins. The authors demonstrated that the principal toxic substances found by their method of experimentation occur only in the presence of bacteria and are produced within two to four hours in appreciable quantities in the presence of proliferating bacteria.

The difficulties of chemical analysis of protein compounds made the writers reluctant to identify the principal substances as proteose, although some of the tests indicated that they were primary and secondary proteoses. If these toxins could be more accurately identified, it might be possible to find a neutralizing agent for them.

JOHN W. NUZUM, M.D.

Kelly, P. M.: Duodenal Atresia. *Brit. J. Surg.*, 1941, 29: 245.

Duodenal atresia is a rare condition but occurs sufficiently frequently to be borne in mind in the diagnoses of abdominal conditions in infants. It makes up from about one-quarter to one-third of the cases of intestinal atresia. Twenty-six cases of intestinal atresia have been reported in 6,000 autopsies.

The condition is classified in two groups, extrinsic and intrinsic. The causes of the former are (1) peritoneal bands, (2) adhesions, (3) anomalous blood vessels, (4) torsion, and (5) volvulus.

Three types of intrinsic atresia are described (Fig. 1): (1) a formed duodenum with a diaphragm across the lumen, (2) blind ends connected by a cord which may or may not have a lumen, and (3) blind ends without any connection.

There are varying opinions concerning the cause and the pathology. Most probably it is a failure of development.

Early diagnosis and prompt surgical intervention offer a cure in these cases, which otherwise invariably end fatally. The mortality has been estimated as 99.5 per cent. Ten successfully treated cases have been reported in the literature.

The diagnosis rests upon the following five points: (1) persistent vomiting from birth, (2) vomitus usually containing bile and sometimes pure or altered blood, (3) fullness in the epigastrium, with or without peristaltic waves from left to right, (4) constipation from birth although meconium may be passed, and (5) x-ray visualization with the aid of a barium meal. The differential diagnosis must consider atresia elsewhere in the intestine, congenital hypertrophic pyloric obstruction, and an esophageal pouch. In duodenal atresia vomiting occurs from fifteen to twenty minutes following a meal while in an obstruction lower down the time interval is proportionately longer. Hypertrophic pyloric stenosis seldom develops before the third week and a tumor is usually palpable. An esophageal pouch usually produces vomiting immediately after feeding.

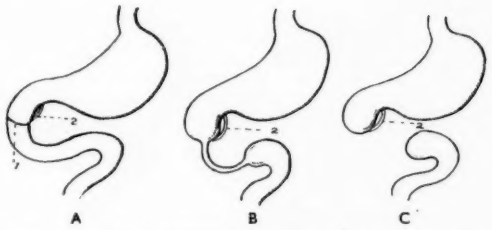

Fig. 1. The three types of intrinsic atresia. A, Formed duodenum with diaphragm across the lumen; B, blind ends connected by a cord which may or may not have a lumen; C, blind ends without any connection: 1, diaphragm across duodenum; 2, common bile-duct.

Treatment consists of an anastomosis between the obstructed and non-obstructed portions of the intestine. In the diaphragm type of obstruction the diaphragm must be cut. In the others an anterior duodenojejunostomy or a posterior gastroenterostomy should be made. Careful preoperative and postoperative attention is essential, with due regard being given to the state of hydration. Following operation, vomiting is frequent for five days and there is an appreciable weight loss which must be combated by careful feeding.

The author reports the case of a three-day-old infant successfully treated by posterior gastroenterostomy. The operative findings are shown in Figure 2. The preoperative and postoperative x-ray films are shown in Figures 3 and 4.

ROBERT D. MANSFIELD, M.D.

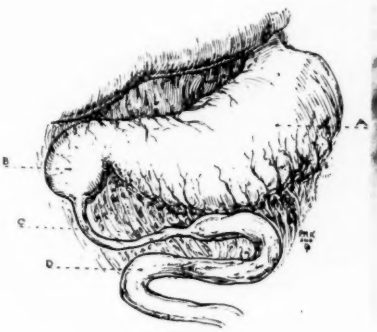

Fig. 2.

Fig. 3.

Fig. 4.

Fig. 2. Diagrammatic operation sketch, showing subtotal atresia of the second and third parts of the duodenum. A, stomach; B, dilated first part of duodenum; C, atresic duodenum; D, collapsed jejunum.

Fig. 3. Roentgenograph taken one hour after barium was given by mouth. Only about one-eighth of the barium has filtered into the intestine; the rest still distends the stomach and esophagus.

Fig. 4. One hour after barium was given by mouth. The stomach is seen to be practically empty and the gastroenterostomy working well.

Svien, H. J., and Rivers, A. B.: Lymphosarcoma Causing Obstruction at the Duodenojejunal Angle. Report of a Case. *Am. J. Digest. Dis.*, 1942, 9: 45.

The most common lesion which produces obstruction high in the small bowel is duodenal ulcer. Other causes of duodenal obstruction may be divided into intrinsic and extrinsic types. The most important intrinsic causes usually are assumed to be congenital narrowing, foreign bodies, pressure by diverticula, tumors (either benign or malignant), or inflammatory disease invading the intestinal wall. Potential extrinsic causes include bands of adhesions (congenital or acquired), enlargement or ptosis of the right kidney, aneurysms of the abdominal aorta, (which may press the duodenum against the mesenteric vessels), anomalies or diseases of the pancreas, or extension of inflammatory disease from the gall bladder.

It is rather surprising that the diseases which invade the gall bladder cause mechanical disturbance in the duodenum so infrequently. A diseased gall bladder, even though it has enlarged tremendously, rarely produces obstruction of the small intestine.

Sometimes a large gall stone passes into the duodenum through a cholecystoduodenal fistula and causes obstruction of that organ. Occasionally, duodenal obstruction is caused by pressure of the lymph nodes which surround the intestine. At times, prolapse of the duodenum or pressure behind it by pushing the intestine against the mesenteric vessels may cause either intermittent or chronic interference with the normal emptying of the duodenum.

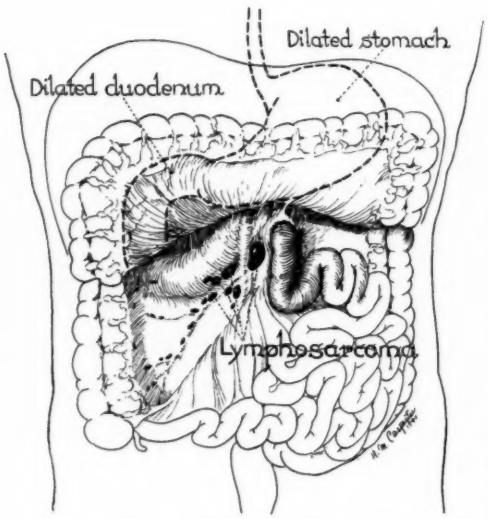

Fig. 1. Location of enlarged mesenteric nodes producing intermittent intestinal obstruction at duodenojejunal angle.

The authors report a case of intestinal obstruction at the duodenojejunal angle caused by a relatively rare lesion which produced obstruction in a manner still more rare.

A man thirty-eight years of age developed in December, 1936, a dull, aching pain in the right middle portion of the abdomen. In January, 1937, he began to vomit once a day at variable times after meals. In January, 1938, diarrhea developed; this condition had persisted for four months. The patient stated also that he had noticed undigested particles of food in the stools. In March, 1940, he had noticed loss of appetite, weight, and strength, and diarrhea had recurred for a week. Subsequent to this he had begun to have epigastric pains associated with excessive borborygmus. He had experienced some nausea, eructation of gas, and also heartburn.

The results of physical examination were essentially negative, except for mild distention of the upper portion of the abdomen and a small, firm, freely movable mass about 3 cm. in diameter, which was palpable in the right portion of the abdomen at the level of the umbilicus. On roentgenological examination, the thorax, gall bladder, stomach, colon, and terminal portion of the ileum disclosed nothing abnormal; findings in the first and second portions of the duodenum were indeterminate.

While in the hospital for observation, the patient vomited copiously on numerous occasions and on one occasion the vomitus contained coffee ground material.

Exploratory operation revealed a large, dilated stomach and a slightly dilated duodenum. Multiple rounded masses were found in the mesentery of the proximal portion of the jejunum at the duodenojejunal angle. The bowel at this point was thick walled and somewhat dilated. The lesion was too extensive to permit resection and accordingly, gastrojejunostomy was carried out. Several mesenteric lymph nodes were removed for biopsy. The pathologist reported lymphosarcoma. After dismissal from the hospital, following an uneventful recovery, the patient received 11 treatments with roentgen rays to the epigastric region.

Invasion of the mesentery or intestine by lymphosarcoma is relatively uncommon. The tumor occurs twice as frequently in the small intestine as in the large; in the small intestine, the ileum is the most common site of the disease, and the jejunum is involved more frequently than the duodenum; the lesions may be multiple. The detection of superficial lymph nodes as an aid in the diagnosis cannot be depended on. In most cases the predominant symptoms are those of acute or chronic intestinal obstruction and they are more frequently accompanied by dilatation than by stenosis of the intestine. Lymphosarcoma may involve the intestine as an annular or polypoid growth; in some instances, stenosis of the bowel is due to marked involvement

of the mesenteric lymph nodes, which tend to aid in compression of the lumen of the bowel. Males have a greater predisposition to the disease than females, the ratio being 5 to 2. The disease is found most frequently in the first, third, and fourth decades of life; the average age incidence is thirty-three and two-tenths years.

The authors' case illustrates the importance of careful evaluation of the symptoms in the absence of a demonstrable lesion in the stomach or duodenum. Roentgenological evidence of persistent dilatation of the duodenum and retention of large amounts of residue of bile-tinged material suggesting a block below the ampulla made it obvious that somewhere in the upper portion of the small bowel there must be either an intrinsic or an extrinsic lesion invading the ciscus. Pain arising from disturbances involving the upper portion of the small bowel is situated about the umbilicus.

It was the opinion of the authors that in their case the pain was in all probability attributable to intermittent distention of the duodenal loops caused by the peristaltic rushes in the attempt to overcome the periodic mechanical obstruction. After the duodenal contents had been forced through the partially blocked portion, circular muscle spasm of the intestinal wall disappeared and the pain was dissipated.

The possibility of lesions invading the small bowel must always be remembered in attempting to evaluate symptoms which are localized to the umbilical region. In such cases, when lesions involving the stomach, duodenum, colon, and lower portion of the ileum cannot be demonstrated, the entire small bowel should be searched carefully by roentgenological investigation or exploratory operation. If this is done, many lesions will probably be discovered which are producing the distress that at present is attributed to functional disease.

JOSEPH K. NARAT, M.D.

DeBakey, M.: A New Clamp for Aseptic Anastomosis in Gastrointestinal Surgery. *Surgery*, 1941, 10: 826.

The instrument used by the author has a strong crushing clamp similar in construction to the Rankin clamp, except that there is no middle blade. Two thin-bladed clamps and a clamp holder complete the accessories.

One thin-bladed clamp is fitted into the large crushing clamp and secured in place. The bowel at the site of resection is placed between the blades and crushed and divided aseptically. A nut is then screwed on to the ends of the thin-bladed clamp and the crushing clamp is opened. The thin-bladed clamp is removed to leave one site for anastomosis. This procedure is repeated at the other site of division. The thin-bladed clamps thus contain the proximal and distal ends of the bowel, which are placed in the clamp holder where the blades can be rotated so the anastomosis may be more readily sutured.

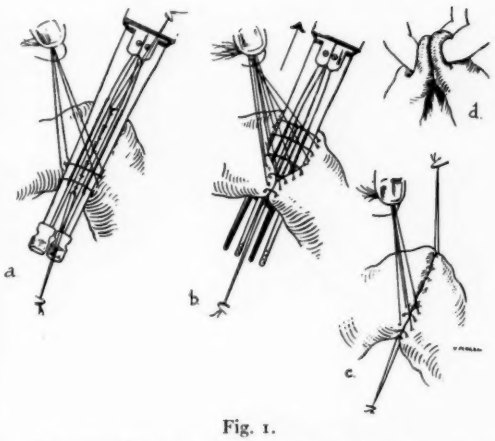

Fig. 1.

The remainder of the technique is the same as that of aseptic intestinal anastomosis over clamps of many varieties (Fig. 1).

RICHARD J. BENNETT, JR., M.D.

Skarby, H. G.: A Case of Primary Partial Intussusception of the Appendix Diagnosed with X-Rays (Ein Fall von roentgendiagnostizierter primaerer, partieller Appendixinvagination). *Acta radiol.*, 1941, 22: 471.

In ileocecal intussusception the appendix is often found as part of the intussusceptum, having been drawn into the intussuscipiens without being inverted. Rarely does one find a partial or complete invagination of the appendix in such cases. The author believes that true intussusception of the appendix exists only when the appendix itself is partially or totally inverted. Judging from published case reports, true primary intussusception of the appendix is extremely rare. Its most common form is appendicocecal invagination and a rarer form is the retrograde intussusception of the appendix. Cases in which an inflamed and swollen appendix imbeds itself in the cecal wall, and possibly becomes fixed by adhesions, are excluded from consideration

Fig. 1.

Fig. 2.

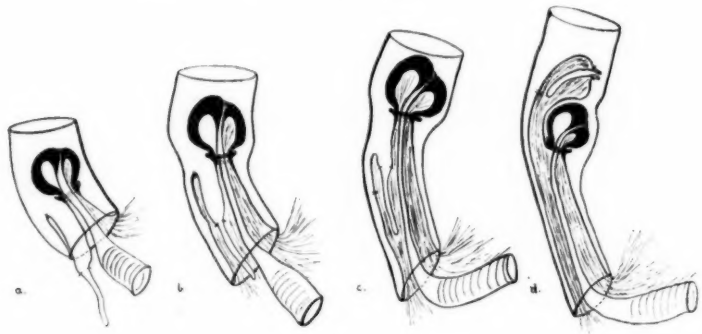

Fig. 3.

here. Such cases are better designated as lateral cecal invaginations. With regression of the inflammatory process, lateral partial invaginations tend to become spontaneously reduced.

In 1922 Szenes collected 55 cases of true, primary and secondary, appendiceal intussusception. Of these only 20 were definitely primary. Since that time 6 more cases have been reported. The case reported here is presumably the first diagnosed with x-rays.

A widow, aged sixty-eight, with a past history of mild perityphlitis at the age of twenty, but without intervening abdominal symptoms, began to have frequent attacks of pain in the right iliac fossa. The pain was recurrent, very severe, and colicky in character without vomiting. Between attacks she was free of pain. Several g.i. x-ray studies were made which showed narrowing of the proximal lumen of the appendix and a typical filling defect in the cecal wall which indicated beginning invagination (Figs. 1 and 2). On one occasion this area was tender. The lesion could be visualized by rotating the cecum so that the contrast medium in the cecum did not cover the base of the appendix. After spontaneous relief from the symptoms, another x-ray study showed no invagination.

According to Szenes 4 types of appendical intussusception can be differentiated: (1) invagination of the appendix on itself; (2) protrusion of the appendix partly or entirely into the cecum; (3) invagination of the appendix plus the portion of the cecal wall adjacent to the appendix base; and (4) intussusception of the appendix in association with intestinal intussusception. In the first three groups the appendix is the primary intussusceptum.

It is often difficult to determine the original cause of appendical invagination when it is associated with a large ileocecal invagination. The mechanism by which the appendix may become inverted in such cases is illustrated in Fig. 3. The intussusception begins in the region of the ileocecal valve as an ileal type progressing to the ileocolic type (Fig. 3a). The cecum is drawn inward and the appendix follows (Fig. 3b). Due to swelling and tension the original apex is held back, and the cecum may become inverted by peristalsis in the outer intestinal tube. Inversion of the appendix may follow (Fig. 3d). Complete inversion of the appendix was present in 7 of Szene's 28 cases.

Certain anatomical and functional conditions predispose to invagination of the appendix. In addition to a funnel-shaped base in the fetal type of appendix, tumors in the appendix base which are large enough to be acted upon by colon peristalsis may lead to intussusception. Lymphoid hyperplasia or local inflammation near the appendix base with swelling also may cause invagination. Two-thirds of the cases occur before the patients reach the age of ten with males predominating. In the remaining third there is no difference in sex incidence. No case was found in patients less than two years of age in contrast to the age incidence of ileocecal intussusception.

The clinical picture of appendical invagination is recognized by intermittent, often very intense, colicky pain of short duration. The attacks of colic are probably a result of tension on the mesenteriolum. Fever is usually absent but vomiting during the attacks is common. Occasionally a small invagination tumor may be palpated. Muscle defense over the appendix is often found. The picture is similar to but usually more severe than that of chronic appendicitis.

Treatment calls for reduction of the invagination and appendectomy. In order to prevent reinvagination of the appendix base, Szenes always performs a limited cecal amputation. This is necessary in cases in which the invagination cannot be reduced. Fixation of the cecal pole, like intestinal fixation in other forms of intussusception, may be advisable.

JOHN L. LINDQUIST, M.D.

Dennis, C.: Physiological Behavior of the Human Appendix and the Problem of Appendicitis. Reaction of the Appendix to Drugs. *Arch. Surg.*, 1941, 43: 1021.

The observations on which this article is based were made on 272 excised appendixes, 11 appendixes which were studied *in situ* by means of an appendi-

costomy, 1 excised ureter, and 2 catheterized ureters *in situ*.

The degree and nature of muscular activity of surviving human appendixes were investigated with the aid of the water bath illustrated in Figure 1. This consists of a horizontal tray containing 180 cc. of fluid kept at 37° C. by a thermostat. At one end of the tray a glass cannula is fixed in position below the level of the fluid in the bath. A tube connects this cannula to a recording mercury manometer and to an elevated flask of Locke's solution without dextrose which is fitted with an adjusting valve and a gravity drip bulb. A pulley mounted at the far end of the bath leads a thread attached to the end of the specimen opposite the cannula to a recording lever. An oxygen jet is fixed in one corner of the bath and fluid coming to the cannula is preheated in a submerged coil of tubing which, however, is not shown in the diagram.

The record obtained with this apparatus indicated the resistance to the flow of fluid through the lumen of the specimen and the variations in its length.

Most appendixes demonstrated active rhythmic contractions of the longitudinal muscle and of the circular muscle. Inflamed specimens did not contract as well as others.

The resistance to the flow of fluid through the lumen of a normal appendix *in situ* is due primarily to the circular muscle tone and varies with rhythmic contractions of the muscle.

The normal intraluminal tension is equal to the absolute resistance to outflow of fluid in the normal appendix and is usually from 15 to 30 cm. of water pressure, while that of the cecum is from 2 to 5 cm.

To evaluate the action of drugs on appendixes in the water bath, rhythmic contractions were allowed to develop until they had become fairly uniform. The agent was then added to the solution at a corner of the chamber as far from the specimen as possible. No alteration of drug effect by any degree of inflammation was found as long as spontaneous movements were present before administration of the drug. To evaluate drug action on appendixes *in situ*, the drug was administered by subcutaneous injection.

Barium chloride hastened the initiation of contractions in the excised appendix.

Epinephrine produced a distinct quieting effect on excised appendixes and on those *in situ*.

Ephedrine and morphine produced variable effects.

Amphetamine sulfate in adequate concentration produced an increase in tone and amplitude of contraction waves in both layers of muscle.

Acetylcholine caused a moderate rise in resistance to flow and marked shortening of the specimen with temporary disappearance of most of the big waves in both muscular layers of the appendical wall.

Physostigmine and pilocarpine produced increased tone in both muscle layers.

Atropine exerted only a slight increase in tone and rate of rhythmic contractions of the longitudinal muscle.

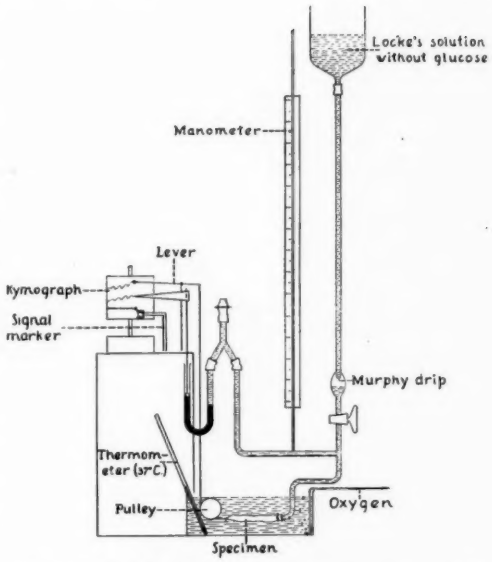

Fig. 1. Schematic drawing of the apparatus used for water-bath studies of surviving excised human appendixes.

Nicotine produced a very transient rise in tone in both muscular layers and a simultaneous loss of rhythmic contractions.

Papaverine stopped rhythmic contractions of the excised specimens without appreciable change in tone.

Spinal anesthesia produced a slight elevation of the basal level of resistance.

Comparable experiments on the excised human ureter showed very little effect from prostigmine, pilocarpine, atropine, amyl nitrite, morphine, or epinephrine.

Because of the action of epinephrine in relaxing the circular muscle of the appendix, this drug was injected subcutaneously into 9 patients who were thought to have acute appendicitis. Seven who proved to have acute appendicitis obtained complete or partial relief. Two obtained no relief. One of these proved to have acute appendicitis and the other a ureteral obstruction.

Seepage through the appendical wall was often observed during the studies and was found to occur at levels of intraluminal pressure commonly reached in appendicitis. Rupture of the appendix is due to digestion of the wall. The normal appendix will withstand an intraluminal tension of more than 2 atmospheres but a gangrenous appendix will rupture at much lower levels of tension.

From his observations the author ventures the opinion that if an appendical obstruction is complete and the mucosa actively secreting, gangrene may be expected to occur; but if obstruction is

spastic and of lesser degree fluid will escape at intervals and gangrene will probably not occur because the mucosal injury produced by sustained moderate pressure would inhibit further secretion after a time and the process would then subside.

EDWARD W. GIBBS, M.D.

Deaver, J. M.: Acute Appendicitis in Children. *Pennsylvania M. J.*, 1942, 45: 358.

This report embraces 417 cases of acute appendicitis in children under fourteen years of age. One hundred and nineteen were perforated and 298 were not perforated. No deaths occurred in the nonperforated group.

The mortality in the perforated cases has decreased from year to year. From 1930 to 1932 it was 16.3 per cent; from 1933 to 1936, 6.5 per cent; and from 1937 to 1941, 3.3 per cent. This decrease in mortality in recent years is attributed to three main factors: (1) improvement in fluid and electrolyte therapy, (2) increasing use of the McBurney incision, and (3) frequent use of duodenal suction.

The symptomatology and pathology of appendicitis is essentially the same in children as in adults but the diagnosis is more difficult in children.

Most of the patients were operated upon immediately after admission. Drainage was used only when gross septic or fecal soiling was present or when considerable exudate was present on the cecum, terminal ileum, or parietal peritoneum. The author advocates removal of the appendix unless there is a localized abscess. Then it should not be removed unless it is accessible and appendectomy can be accomplished without the danger of contamination of uninvolved peritoneum.

There were 11 deaths. Six of these (1 in an unoperated case) were due to peritonitis, 2 to intestinal obstruction, 1 to secondary abscess followed by peritonitis, 1 to intestinal obstruction and peritonitis, and 1 to pneumonia. EDWARD W. GIBBS, M.D.

Mayo, C. W., and Schlicke, C. P.: The Surgical Management of Fecal Fistulas. *Ann. Surg.*, 1941, 114: 1011.

A review has been presented of 155 cases in which abnormal communications between the small or large bowel and the surface of the body existed. In 128 of these cases operation was performed, with a mortality rate of 10.2 per cent.

Evaluation of the results of any given form of operative treatment was difficult because of the number of variables. The highest morbidity and mortality (18.2 per cent) rates accompanied resections. Yet these operations were carried out in the most difficult cases, in which the patients often were afflicted with other disease processes. Healing of the fistula was obtained in 51.9 per cent of those who survived resection. It is obviously unfair to compare these results with those following extraperitoneal closure, in which satisfactory results were obtained in 4 of 5 cases. Simple curettage was followed by healing in only 6 of 14 cases. Intraperitoneal closure, the most common procedure, was attended by a mortality rate of 10.6 per cent, and healing occurred in 64.3 per cent. The least satisfactory results followed the diversion operations, in most of which a second operation would have been required to effect a cure. Yet the safety of these procedures (no deaths in 10 cases) warrants their use in certain cases, in a few of which healing will occur without further interference. The remaining operations were performed in too few cases to justify any conclusions, but in general it may be said that although healing occasionally followed drainage of an abscess or the removal of diseased pelvic organs, results were not satisfactory, as a rule, when the internal opening was not closed.

The authors attempted to determine whether there was any difference between the results following entry into the abdomen through the old incision and through a new one, or following closure with and without drainage. They were unable to correlate results with any of these factors.

When the results were considered in relation to the cause of the fistulas, it was found that satisfactory results were obtained in about 60 per cent of the cases in which the fistula followed appendicitis or diverticulitis, and in the miscellaneous group. The least satisfactory results occurred in the tuberculous (31.3 per cent healed) and malignant (38.5 per cent healed) groups.

Because of the risk and difficulty associated with operative interference, every opportunity should be provided to encourage spontaneous healing. The nature of the fistula and the reason for its persistence should be determined as accurately as possible before operation. There can be no standard method of operating upon fecal fistulas, each case presenting a distinct problem of variable complexity.

LIVER, GALL BLADDER, PANCREAS, AND SPLEEN

Berman, A. L., Snapp, E., and Ivy, A. C.: The Effect of Bile Salts on the Recovery of Liver Function After the Release of Common-Duct Obstruction. *Surgery*, 1942, 11: 1.

There is a clinical impression that oral or intravenous administration of bile salts will increase the rate of elimination of bile pigments accumulated in the blood stream because of biliary obstruction or liver damage. The authors have investigated this question by means of a series of controlled experiments.

Twenty dogs were subjected to double ligation of the common bile duct, resection of a portion of the duct, and cholecystectomy. Jaundice was thus produced, and the dogs were allowed to remain obstructed for seven days. At the end of this seven-day period, the bilirubin content of the blood and urine was determined, after which the animals were reoperated upon and the obstruction was removed by making a biliary fistula with the proximal portion of the cut common duct.

The animals were then divided into 2 groups: one group of 10 animals was fed 3 gm. of ketocholanic acid (ketochol) daily with the meals; the other group was not given any bile salts and served as a control. The preparation used was known to be a potent choleretic. Daily determinations of the pigment content of the blood and urine, and of the cholic acid content of the bile, and Van den Bergh tests were made until the jaundice disappeared.

It was found that large doses of ketocholanic acid had no significant effect on the rate of elimination of bile pigments from the blood and urine. In both groups the pigment disappeared from the blood and urine and a normal total cholic-acid output (approximately 1.2 gm. per day) occurred in approximately five days after release of the common-duct obstruction. Early return of preoperative eating habits hastened the recovery of cholic acid; but the bile salt secreting function of the liver was little improved by the administration of bile salts.

Although the results show that the administration of bile salts will not definitely increase the rate of removal of bile pigment in the jaundiced animal, they apparently do no harm and consequently are not contraindicated. S. Lloyd Teitelman, M.D.

Rigler, L. G., Borman, C. N., and Noble, J. F.: Gall-Stone Obstruction. *J. Am. M. Ass.*, 1941, 117: 1753.

Gall-stone ileus is one of the conditions in which the hazard of any therapeutic procedure other than surgical intervention is great. From their own experience and impressions gained from reported cases, the authors believe that an exact diagnosis of dynamic ileus due to gall stones can be determined by roentgen examination. Such a diagnosis should suggest early operation. Most stones producing occlusion enter the small bowel directly from the fundus of the gall bladder. Next in frequency are those which pass through a perforation between the common duct and the duodenum. While many stones which enter the intestinal canal through an abnormal passage may pass spontaneously, those more than 25 mm. in diameter usually produce obstruction in the narrowed terminal ileum. Stones entering the colon seldom produce frank obstruction and are passed per rectum.

The abnormal opening between the small intestine and the gall bladder or common duct permits gas or ingested barium to fill the biliary tract. This is a most important sign in the diagnosis of this type of intestinal obstruction. The obstruction occasioned by the gall stone results in the accumulation of gas which is forced by the increased intestinal pressure into the biliary passages. Films taken of the right upper quadrant of the abdomen show this gas in the biliary passages better than do films taken of the entire abdomen.

Regurgitation of contrast material through what has been termed "an incompetent common duct sphincter" has been observed in the presence of a stone lodged in the lower end of the common duct, and in a case of carcinomatous metastasis which produced a high jejunal obstruction. However, the proof of an incompetent sphincter and the absence of a fistula has not been offered. Barium has been demonstrated in the distal ends of the ducts in cases of chronic pancreatitis. Indurating, usually malignant, lesions adjacent to the common duct are known to have permitted reflux. Emphysematous cholecystitis and cholangitis incident to infections of the biliary tract with gas-forming organisms may rarely produce gas in the ducts. With these possible and rare exceptions the presence of contrast material or gas in the biliary tract is synonymous with fistula formation. Accordingly, the demonstration of air or barium in the bile ducts in association with intestinal obstruction practically excludes any consideration other than occlusion from a gall stone.

In a certain percentage of cases, especially when clinical signs point to the possibility of gall-stone ileus and when careful search is made, the stone will be seen directly in the roentgenogram of the abdomen. Unless considerable calcification and lamination are present, the calculus may well escape detection, especially when the obstruction has resulted in fluid and gaseous distention of the bowel. The administration of barium as an aid in detection is not a recommended procedure. However, the determination, before surgical exploration, of the quadrant occupied by the stone and the relative position of the stone in the small intestine facilitates removal with a minimum of trauma.

The disappearance of previously demonstrated gall stones, or more especially, detection of the same shadows of gall stones in the lower part of the abdomen following previous observation in the right upper quadrant is of distinct diagnostic value. However, this sequence of events must be considered unusual as well as fortunate. The presence of a demonstrable stone in the gall bladder which is faceted but without a sister stone may be sufficient to arouse suspicion, but it is only suggestive.

The roentgen evidences of intestinal obstruction are also to be found; the classic distention of several loops of the small bowel with gas, the unusual visibility of the small intestinal segments, and the relative absence of gas in the colon may be observed. Case reports are presented to illustrate the diagnostic value of the roentgen examinations.

Manuel E. Lichtenstein, M.D.

MISCELLANEOUS

Poer, D. H., and Woliver, E.: Injury Due to Nonpenetrating Abdominal Trauma. *J. Am. M. Ass.*, 1942, 118: 11.

In an interesting survey the authors review the entire literature from 1889 to the present regarding injuries to the intestine and mesentery by force not sufficient to penetrate the abdominal parietes. Their communication sets forth the results of studies of a surgical problem for which treatment up to now has been significantly unsuccessful as evidenced by the

high mortality rate. They have found that the total mortality, although decreased since 1935, is still over 61 per cent.

Three factors are proposed as the chief mechanisms in the production of intestinal rupture: (a) crushing injuries in which the external force compresses the bowel against the spine or pelvic bone; (b) a tearing injury from a violent force applied at a tangent to the body; and (c) a bursting injury to the normal bowel such as produced by the introduction of compressed air into the anal canal.

These injuries are brought about by relatively small varieties of accidents such as personal encounters in which a patient is struck or kicked, or falls upon the abdomen; industrial accidents, the damage being caused by a blunt object striking the abdomen with considerable force; or transportation accidents, in which the vehicle is frequently moving at a fast rate of speed.

Hernia is considered a predisposing cause in these types of injuries, and the most frequent site for them is the ileum. The cases studied were classified into three groups: (a) those in which diagnosis and treatment were delayed more than twelve hours after the accident; (b) those in which diagnosis and treatment were promptly carried out; and (c) those in which multiple severe injuries overshadowed the serious abdominal condition.

The high mortality is attributed in part to the fact that no sign or symptom of the serious nature of the injury may appear within the first few hours. Consequently, the grave complication of peritonitis may be the first inkling that the bowel has been injured. Explanation for such a catastrophe is found in the fact that the trauma produces only an incomplete rupture of the intestine, with subsequent leakage through the injured bowel. Distention and spillage is facilitated by the fact that a large percentage of these injuries are received soon after the patient has eaten. Temporary intestinal paresis may set in because of the severity of the injury, with subsequent leakage after the patient has recovered from the primary shock, or after the first intake of food.

In the authors' series, the most constant diagnostic signs noted were abdominal pain or tenderness, steadily increasing pulse rate, and muscular rigidity. Pallor, diaphoresis, early tachycardia, and abnormal blood pressure were significant frequent early findings to direct attention to the gravity of the injury.

The method of treatment emphasized the necessity of keen clinical judgment to determine when and when not to operate. However, it was believed wiser to risk an unnecessary immediate abdominal operation while the condition of the patient was good than to delay operation. Consequently, the immediate concern is the preoperative treatment for shock and dehydration. The operative procedure should consist in doing a thorough job as rapidly and expeditiously as circumstances permit, often merely exteriorizing the injured bowel. The postoperative care includes particularly adequate intestinal decompression with administration of the sulfonamide drugs, orally or parentally.

STEPHEN A. ZIEMAN, M.D.

GYNECOLOGY

UTERUS

Rendle-Short, C.: The Problem of Operation for Retroverted Uterus. *Brit. M. J.*, 1941, 2: 649.

In this series of cases reported by the author there were altogether 120 patients operated upon for backward displacement of the uterus between the years of 1930 and 1937. All these were asked to attend for examination; 92 did so and 6 wrote letters. Their symptoms were the usual ones associated with the condition: namely, backache, abdominal pain, either on the left or right side, menstrual disorders usually in the form of menorrhagia, dyspareunia, or vaginal discharge. Every patient had one or several of these symptoms. Lower abdominal pain was a more common symptom than backache. None of these patients had tried wearing a pessary before operation, nor had any patient been investigated by the orthopedic department.

The operation consisted of shortening the round ligaments by means of medium linen thread with a running stitch going from side to side for the length of each ligament. The two ends of the thread were tied firmly so that the round ligament was plicated. If the ovaries were found to be prolapsed they were suspended by shortening the ovarian ligaments, and any small retention cysts were pricked. All the patients in this series made a good immediate recovery.

All patients had been operated on at least three years previously, some as long as seven years previously. In only 50 per cent was the result perfect both anatomically and symptomatically. In 29.3 per cent the anatomical result appeared perfect but certain symptoms remained or new symptoms had arisen since operation. In 8 per cent, the patients were well symptomatically but the uterus had gone back to its old position. Eleven cases were counted as failures. Twenty-one patients had normal pregnancies after the operation, and in 17 (90.4 per cent) the uterus was still in good position after delivery. There were 19 patients who were operated upon because of sterility, 11 (57.9 per cent) of whom subsequently became pregnant.

The author concludes that a pessary should always be tried first, for if it relieves the symptoms the operation will probably be a success; if the main trouble is backache, the patient should, if not relieved by a pessary, be examined by an orthopedic surgeon. Symptomatic failures are no doubt due to the fact that these women believe the retroversion to be the cause of all their troubles, when actually they are due to some other factor, either organic or functional. In cases of sterility or repeated abortion for which no other cause can be found there is a reasonable chance that a successful pregnancy may result following a suspension.

DANIEL G. MORTON, M.D.

ADNEXAL AND PERIUTERINE CONDITIONS

Black, J., Heyns, O. S., Gillman, J.: Persistent Functional Corpus Luteum. *J. Obst. & Gynaec. Brit. Emp.*, 1941, 48: 685.

A persistent corpus luteum is loosely regarded in clinical gynecology as being a possible cause of amenorrhea. As there are no biological tests available for assessing accurately the activity of the corpus luteum in the human female, the authors attempted to prove the functioning capacity of the corpus luteum on histological grounds. They studied a case of amenorrhea of eighteen weeks' duration, in which at operation a large corpus luteum was found. They describe the histological appearance of the corpus luteum and its accompanying endometrium.

Their description of the persistent functional corpus luteum differed from the description of the corpus luteum of early pregnancy only with reference to the central coagulum. It was present in the early months of pregnancy and in the persistent corpus luteum. Both types of corpus luteum were lined by fibrous tissue. The distribution of colloid was more pronounced in the pregnancy corpus luteum. In the persistent corpus luteum there was an abundance of precolloid and a little colloid. Except for these two facts, it was a difficult matter to distinguish between the two histologically. The histological picture of a premenstrual corpus luteum differed from that of the persistent corpus luteum in that the central coagulum was large and there was no band of fibrous tissue separating the inner part of the lutein tissue from the central coagulum.

The authors also studied the endometrium and showed that the infranuclear or basal fat in the gland cells could be used as an indicator of progesterone activity. The stromal cells, however, never reached a greater activity than that encountered in the second half of the cycle in spite of the fact that the corpus luteum had been active for four months. Their final conclusion was that the persistent corpus luteum differed histologically from the premenstrual and degenerating corpus luteum of menstruation and that it resembled in many respects the corpus luteum of pregnancy. HENRY C. FALK, M.D.

Ahumada, J. L.: A Report on 66 Cases of Suppurative Ovaritis (Consideraciones a propósito de sesenta y seis observaciones de ovaritis supurada). *Rev. méd. Lat.-Am.*, 1941, 26: 1085.

The author presents a monographic report on 66 cases of suppurative ovaritis observed in the past twelve years. This is a relatively rare infection; the author treated 66 cases in a series of 2,327 gynecological laparotomies performed at the University of Buenos Aires. In only 1 case were the tubes normal; in the rest they showed evidence of suppurative

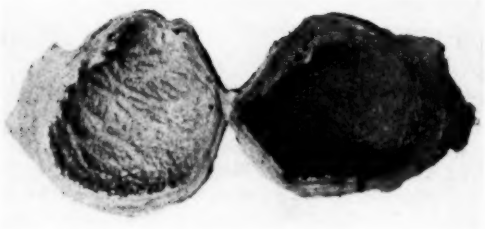

Fig. 1. Incised and emptied ovarian abscess showing the granulated membrane.

salpingitis. The pathogenesis is most varied. In 19 of the author's cases it was due to intrauterine manipulations associated with attempts at criminal abortion. In 2 cases it resulted from treatments of the cervix. One case was due to coitus during menstruation. Eight cases occurred after the termination of labor. One case occurred in a fourteen-year-old virgin after a furuncle of the external auditory canal. In 26 cases the onset was insidious, occasionally associated with gonococcus infection.

The author presents varied reports from the literature; Gross found 58 per cent of his cases occurred after a febrile puerperium; 11 per cent were probably gonococcal, and 9 per cent occurred in infected myomas. A variety of bacteria have been found in this condition; the staphylococcus, streptococcus, pneumococcus, Friedlaender's bacillus, colon bacillus, Eberth's bacillus, and the gonococcus.

The author then describes the pathologicoanatomy of suppurative ovaritis, which varies in size from an egg to an orange (Fig. 1). The abscess cavity may be single or multiple, and may be fused with various neighboring abscesses. There may be plastic adhesions to the neighboring organs. In 4 instances the condition was bilateral. Perforation of the abscess is rare and may occur into the abdominal cavity, into a neighboring organ, or into the abdominal wall. The microscopic findings are described in detail and vary according to the type and severity of the infection. Several photomicrographs illustrate these changes. Clinically the condition occurs, for the most part, during the period of active sexual life; 86 per cent of the cases occurred in patients between twenty-one and forty-five years of age. In most cases the onset was sudden with severe pelvic pain, fever, and chills. In a small percentage of cases the onset is insidious. In most instances pain is the most constant symptom. There are no characteristic menstrual changes. On pelvic examination a painful, cystic mass is found in the adnexal region. In most instances the course of the infection is essentially chronic.

In the acute stage of the suppuration conservative treatment is advised with physical and sexual rest, cold applications, and the administration of sulfanilamides. When the condition becomes chronic, diathermy and short-wave treatment may help. In this stage surgery is usually desirable and indicated. In 45 cases simple extirpation of the ovary and sometimes of the adnexa, with the application of a Mikulicz drain was sufficient. In the others more radical procedures were necessary, sometimes even hysterectomy. There is a considerable mortality after surgical treatment of this condition (6 deaths in 66 cases or 9.09 per cent). In 3 of the latter cases a simple ovariectomy was done; in the other 3 a subtotal adnexohysterectomy. The chief principle in the surgical technique is to avoid contamination of the general abdominal cavity. Colpotomy is not advised as a form of treatment for this condition.

JACOB E. KLEIN, M.D.

Gilbert, B., and Sheorey, B. K.: A Discussion on the Origin of Cysts of the Broad Ligament. *J. Obst. & Gynaec. Brit. Emp.*, 1941, 48: 549.

The authors call attention to the confusion in the nomenclature used by clinicians for cysts that originate in the broad ligaments. They are variously referred to as fimbrial cysts, parovarian cysts, wolffian cysts, cysts of Gartner's ducts, and cysts of the broad ligament. It is suggested that clinicians should be content to group them under the heading of cysts of the broad ligament. Their exact nature is dependent on their location in the broad ligament and the histology of the cyst wall; consequently it falls within the province of the pathologist to label each cyst correctly.

In general, cysts of the broad ligament are of two types: (1) those derived from primitive cells of high potential, which are rare; and (2) those derived from the vestigial structures, which are common.

The first portion of this article is devoted to a consideration of pertinent embryology dealing with the origin of the genital and nephric systems. In this manner the authors direct attention to the various types of vestigial structures found in the broad ligaments.

Cysts of the broad ligament may be derived from the following:

1. The hydatid of Morgagni (attached to the ovarian fimbriae).
2. Kobelt's tubules, the terminal ones may be pedunculated.
3. The tubules of the epoöphoron (the genital mesonephric tubules).
4. The wolffian duct in the broad ligament.
5. The tubules of the paroöphoron.
6. The junctional tubules.
7. Diverticula of, and accessory, fallopian tubes.
8. Gartner's duct in the uterine wall (these usually point in the vaginal fornix).
9. Cells of high potential which take origin from the nephrogenic cord and become incorporated in the substance of the broad ligament; as the result of an unknown stimulus they develop into cysts which are found in the broad ligament or in the ovary. Mesonephromas fall into this group.
10. Connective-tissue structures, e.g., canalized endotheliomas.

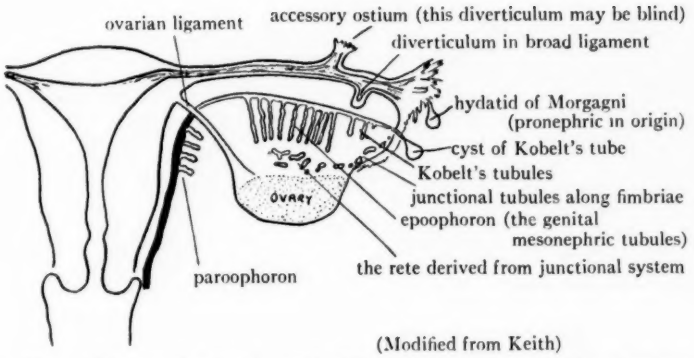

Fig. 1. Diagram showing the residual urogenital structures which are present in the broad ligament. Cysts may arise from any of these structures. The shaded portion of the wolffian duct normally disappears; when present it is known as Gartner's duct.

Most cysts of the broad ligament which one encounters in practice are large and have very thin walls. In the past they have incorrectly been referred to as parovarian cysts whereas in reality they probably arise from junctional tubules. On the other hand, small cysts of the broad ligaments are often derived from the vestigial structures which may be called the parovarium, that is, the wolffian duct in the broad ligament and the genital and nephric tubules.

Cysts lined by tubelike, endometriumlike, and cervixlike epithelium are probably of muellerian duct origin; these may occur anywhere in the broad ligament, as the Muellerian duct traverses this structure from end to end. The first type give rise to serous cysts lined by ciliated columnar epithelium, the second to endometriomas, and the third to pseudomucinous cystomas.

A hydatid of Morgagni is of pronephric origin. It is attached to the ovarian fimbriae. Kobelt cysts are probably also of pronephric origin and all cysts of this type are small and lined by flattened epithelium.

Cysts of the horizontal part of the wolffian duct are rare, but cysts of the lower part of Gartner's duct, which is generally absent in women, are more common. The vertical genital tubes sometimes undergo cystic change. Cysts from this site are lined by columnar epithelium usually devoid of cilia and are surrounded by unstriped muscle fibers.

Cysts derived from the junctional tubules may reach large dimensions. They are the commoner cystic tumors of the broad ligament. By their anatomical position they cause the fimbriated portion of the fallopian tube to be stretched out over them. They are lined by a single layer of extremely thin epithelial cells. Their supporting wall is the connective tissue of the broad ligament compressed into a very thin capsule. Muscle fibers are absent; they are found in the wall of cysts derived from the genital tubules. Although most junctional tubule cysts have a smooth lining, it is not uncommon to find flat papillae in those of long standing.

A case history is given of an elderly woman with a cyst of the broad ligament which, with the fallopian tube and the ovary, had undergone torsion. A cyst of the broad ligament which undergoes torsion is usually located in the angle formed by the ovarian fimbriae and the ovary. In nearly all cases it is of junctional-tubule origin. Large cysts of the broad ligament, by virtue of their size, position, and relative lack of mobility, rarely undergo torsion.

GEORGE H. GARDNER, M.D.

MISCELLANEOUS

Meigs, J. V.: Endometriosis—Its Significance. *Ann. Surg.*, 1941, 114: 866.

The author recognizes the increased frequency of endometriosis and suggests that it may be due to delayed marriages and lack of early and frequent childbearing. It is possible that endometriosis is brought about by a physiological response to persistent and uninterrupted menstruation.

In this article the author refers to areas of ectopic endometrium either in the ovary, tube, pelvic peritoneum, on the uterus, or in the uterosacral ligaments; he does not include adenomyoma of the uterus. This ectopic tissue may respond to the stimulation of estrin to produce the growth phase and to progesterin to produce the secretory phase, or to pregnancy to produce decidua in the stroma, but just as the basal layer of the normal endometrium does not react to an ovarian stimulation, this "tumor" also may not do so.

The theory proposed by Iwanoff and Meyer for the origin of endometriosis appeals more strongly to Meigs than any of the others. Pelvic peritoneum is celomic epithelium and celomic epithelium is the original source of the endocervix, endosalpinx, and

endometrium. In an adult it may still contain groups of viable embryonic cells, and under certain conditions they may grow and in growing reproduce what they produced in the embryo. The frequency of endometriosis in patients with stigmata of underdevelopment is twice as great as in those without it. It seems likely that patients with underdevelopment may have more leftover cells. Among such stigmata Meigs includes congenital erosions of the cervix, painful breasts, narrow pelves, severe dysmenorrhea, juvenile uteri, and infrequent menstrual periods. The author believes that pregnancy, in some way, is a check on the development of endometriosis, and although it perhaps does not prevent endometriosis, it probably has something to do with its prevention.

The increased frequency of endometriosis may be actual or it may be due to more careful observation. There is no doubt that great interest stimulates more careful search for pathology. However, a more important reason may be that endometriomas are not tumors; they merely represent abnormal physiology due to late marriages or delayed and infrequent childbearing. Consequently, the economic pressure of this era is an important factor in the increased present-day incidence of endometriosis. Meigs urges that patients with apparent infertility, evidence of underdevelopment, and older girls about to be married should be taught how to become pregnant and not how to avoid pregnancy. He has compared the incidence of endometriosis in private practice with the incidence in a similar group of patients from the Massachusetts General Hospital. In many instances these patients were not suspected of having endometriosis before operation and frequently the endometriosis consisted of a very small isolated area. However, this small area might have grown larger if let alone.

	Private Cases	Cases at Mass. Gen. Hospital
Abdominal gynecological operations	400	400
Histological endometriosis	112 (28%)	23 (5.8%)
Gross endometriosis	144 (36%)	33 (8.3%)
Abdominal gynecological operations excluding cases past the menopause	357	348
Histological endometriosis	108 (30.2%)	19 (5.4%)
Gross endometriosis	139 (38.9%)	28 (8 %)

Region of endometriosis	
Ovary	57.1%
Peritoneum	51.6%
Uterosacral ligament	18.7%
Operation	
Radical	85.7%
Conservative	14.3%
Symptoms	
Dysmenorrhea	32.1%
Pain other than dysmenorrhea	33 %
Urinary symptoms	23.2%
Change in catamenia	57.4%
Bowel symptoms	28.6%

CONCLUSIONS

1. Delayed marriage, and delayed and infrequent childbearing all contribute to the increase in endometriosis.

2. Less well-to-do patients in a general hospital population have less endometriosis than patients in private practice.

3. Stigmata of underdevelopment mean lowered fertility and a greater incidence of endometriosis.

4. The celomic epithelium or pelvic peritoneum may be stimulated to produce endometriosis (Iwanoff and Meyer).

5. Modern economic trends are responsible for delayed marriage.

6. Young married couples should be urged to have children early, and practice contraception after they have had their families. They should be taught how to have children, not to avoid having them.

GEORGE H. GARDNER, M.D.

OBSTETRICS

PREGNANCY AND ITS COMPLICATIONS

Schauffler, G. C., and Wynia, F. O.: Ectopic Pregnancy. *Am. J. Obst. & Gynec.*, 1941, 42: 786.

Sixty-five cases with the pathological diagnosis of ectopic pregnancy are reviewed. The impression that previous operations, abortions and pelvic infection contribute to the incidence of ectopic pregnancy is supported.

Hematology and blood-pressure observations support generally accepted conclusions. The experience of the authors with transfusion parallels that of most other observers. Autohemoclysis, as an emergency measure, has been used with consistent benefit when suitable blood was not available.

In 28 cases, surgery other than removal of the ectopic pregnancy was performed, but not in the presence of infection or free bleeding. These patients did exactly as well as the rest of the group. It is thought that this surgical attention may account for the fact that no second ectopic pregnancies are recorded (28 per cent were sterilized). The other reported incidence was from 3.6 to 22 per cent.

The mortality rate was 3 per cent. Diagnosis was 80 per cent correct. The routine use of the Friedman test improved the percentage of correct diagnoses.

Seventeen endometriums were available for pathological examination. Had these tissues been obtained by curettage, diagnosis would have been assisted in only 6 of the 17 cases and definitely confused in the remainder.

Microscopic examination of the tubes and other tissues indicates some further basis for the hypothesis of ectopic placentation in areas of ectopic endometrium or decidua.

Cul-de-sac puncture has been harmless and exceedingly valuable in diagnosis. The peritoneoscope has been used. Its status is discussed. Three unusual cases are reported and illustrated.

EDWARD L. CORNELL, M.D.

D'Esopo, D. A.: The Occipitoposterior Position. *Am. J. Obst. & Gynec.*, 1941, 42: 937.

The occipitoposterior position in the main is caused by the adaptation of the head to a pelvis having a narrow fore-pelvis and an ample anteroposterior diameter and therefore may be considered "physiological." Degrees of the posterior position can be differentiated. A true posterior position is one in which the occiput is at or posterior to the sacroiliac synchondrosis.

Occipitoposterior positions, although physiological and in spite of the fact that 70 per cent deliver spontaneously, cause more dystocia than the other vertex positions. Dystocia in posterior positions originates with the abnormality of the pelvis in which these positions occur. Extension is a common feature of the posterior mechanism and is caused by the posterior axis of the fetal drive. Extension not only results in larger presenting diameters but also causes a part of the uterine drive to be dissipated. Flexion greatly facilitates the mechanism and should be encouraged by posture. A forward excursion of the fetal axis must take place before flexion can occur.

Internal rotation although receiving its impulse from the inclined planes of the pelvic floor receives its directional force from the variable resistances offered by the bony pelvis in all the pelvic planes through which the head is descending. Since the pelvic architecture shows marked variations in shape, it follows that the patterns of rotation show corresponding variations.

Emphasis is placed on the importance of recognizing two fundamentally different pelvic forms frequently associated with posterior positions, viz., those forms in which the transverse diameters are contracted at the brim or midpelvis or at both levels with compensating ampleness in the anteroposterior diameters, and the converse of this form in which the anteroposterior diameters are shortened by virtue of a flat posterior segment at the brim or a forward sacrum at the midpelvis level while the transverse diameters remain ample. It follows that operative techniques should be individualized for each type. The occipitoposterior mechanisms which have been reviewed may be translated into operative principles as follows:

When the posterior arrest is due to a narrow anthropoid pelvic brim preventing rotation, the head is pushed up and rotated above the brim. Version is also correct in principle.

When arrest is due to narrow spines in definite anthropoid types, the head is pushed up and rotated above the spines or above the brim. Version is also an alternative procedure.

When the posterior aspect of the inlet is flat or the sacrum is forward, rotation is carried to the transverse only and in this position the head is brought into the lower fore pelvis or the retropubic space thereby producing a deep transverse position. Rotation is carried out at this low level. Upward displacement of the head with rotation and version are incorrect procedures.

When the posterior aspect of the inlet is flat or the sacrum is forward and labor has progressed sufficiently to allow a deep transverse arrest to occur rotation is again carried out at a low level just behind the pubis.

When the head is arrested in a direct occipitoposterior position, deliver without rotation only when the lower sacrum is not encroaching. In most cases the head should be rotated to the anterior. Such rotation is carried out at the level which is found to be most suitable for the pelvis in which it occurs.

When the head is low, well molded, and well flexed, manual rotation is the most desirable procedure.

Rotation at level of arrest is rarely a procedure of choice because in most instances there is some pelvic obstruction which is preventing rotation at that level.

The unmodified Scanzoni maneuver with simultaneous traction and rotation initiates the act of rotation at the level of arrest when there is obstruction. It is, therefore, an undesirable procedure in those cases which have a well molded and flexed head. Even in these cases manual rotation is the operation of choice. EDWARD L. CORNELL, M.D.

PUERPERIUM AND ITS COMPLICATIONS

Ramsay, A. M., and Gillespie, M.: Puerperal Infection Associated with Hemolytic Streptococci Other Than Lancefield's Group A. *J. Obst. & Gynaec. Brit. Emp.*, 1941, 48: 569.

The occurrence of 3 fatal cases of streptococcal endocarditis, 2 of Group B and 1 of Group G, in the Puerperal Sepsis Unit at the North-Western Hospital during the past year led the authors to analyze their records of cases associated with hemolytic streptococci other than Group A during the four years from 1937 to 1940. Death in the 3 cases was due to subacute endocarditis. These cases are compared with 8 similar cases reported in the literature.

In the last four years (from 1937 to 1940) 48 cases in which hemolytic streptococci other than Group A were found have been observed by the authors. They constituted 14.74 per cent of the total cases of hemolytic streptococcal infections admitted during that period. Twenty-three of the cases were post-partum, and 25 post-abortum. In the post-abortum series 43.1 per cent of the streptococcal infections were due to streptococci other than Group A, compared with 9.3 per cent in the post-partum group.

There were 16 patients in Group B, in 2 of whom the infection proved fatal. Nine of these cases were post-abortum and 7 post-partum. Offensive lochia was present in every patient in this group in which there was sepsis of the genital tract, excluding the 2 patients with fatal septicemia. The pyrexia was for the most part mild and of short duration. Leucocytosis was quite a marked feature of these cases.

There were 12 cases in Group G. Two patients died, one from infective endocarditis, and the other as a result of extensive pelvic peritonitis; 6 of the cases were post-abortum and 6 post-partum. Apart from the 2 fatal cases, the infection was mild. The most striking feature of the Group G infections was the presence of a high leucocyte count.

Group C consisted of 12 cases. All were mild and none proved fatal. Six were post-partum and 6 post-abortum. White-cell counts carried out in 10 of the cases showed a tendency to rise but not to the extent seen in Group G or even in Group B.

There were 6 cases (4 post-partum and 2 post-abortum) from which Group D organisms were isolated. In 3 of them there was a spread of infection beyond the uterus, but it is difficult to say whether the Group D organism was responsible; no other organism was isolated in any of the 3 cases.

It seems likely that the Group C and G strains come from the throat of some attendant human carrier, while the Group B and D strains may already be present in the genital tract before confinement or abortion.

The most striking characteristic of the severe and fatal infections of the other-than-A groups has been the occurrence of bacterial endocarditis. Although infection with streptococci other than those of Group A is usually mild and does not differ much from mild Group A streptococcal infection, it makes up a high proportion of the streptococcal puerperal infections admitted to this unit. DANIEL G. MORTON, M.D.

Martin, J. P.: Thrombosis in the Superior Longitudinal Sinus Following Childbirth. *Brit. M. J.*, 1941, 2: 537.

Martin, neurologist of the British Postgraduate Medical School, reports 3 cases of apparent thrombosis in the superior longitudinal sinus following childbirth. Two of the patients recovered; the third died "in consequence of a spinal lesion." Autopsy was not obtained. The author points out that a thrombosis of this type has long been known to pathologists as an etiological factor in the production of fatal cerebral symptoms in the puerperium after abortion although little has been written in English on the subject.

Longitudinal-sinus thrombosis is usually preceded by evidence of venous thrombosis elsewhere in the body. It is suggested, following Batson's work, that the pelvic veins have anastomoses with the veins in the vertebral canal and around the vertebral column, thus providing a pathway to the dural sinuses. A fragment of clot so transported might serve as the nucleus of a new clot in the longitudinal sinus. Symptoms and signs result from a limitation of the circulation in the sinus and obstruction of the superior cerebral veins. Absorption of cerebrospinal fluid is prevented which produces a rise of the intracranial pressure and yields in turn to headaches, papilledema, and, occasionally, vomiting. With thrombosis of an obstructed cerebral vein, paralysis, of a degree corresponding to the area of cerebral cortex which the vein drains, results. Convulsions may precede the paralyses. Microscopic examination of cerebrospinal fluid procured by spinal tap may reveal a small amount of blood.

Therapy is directed toward (1) alleviation of the convulsions, (2) reduction of the intracranial pressure, and (3) prevention of further thrombosis. Luminal grains (3), by mouth or injection, repeated as necessary at six-hour intervals, are suggested for the first; intravenous hypertonic (50 per cent of 50–100 cc.) glucose injections, concentrated magnesium enemas (from 2 to 4 oz.), and frequent lumbar punctures for the second; and possibly the administration of heparin for the last. The author admits that

he has had no personal experience with heparin so used. WILLARD G. FRENCH, M.D.

NEWBORN

Päivänsalo, A.: The Effects of the "War of Independence" and the Subsequent Hunger-Period on the Weight and Length of the Newborn in the General Obstetrical Hospital at Helsinki (Ueber die Einfluesse des Freiheitskrieges und der daran Anschliessenden Hungerzeit auf Gewicht und Laenge der Neugeborenen in der allgemeinen Entbindungsanstalt zu Helsinki). *Acta Soc. med. Fennicae Duodecim*, 1941, Ser. B., 27: Fasc. 3.

The author, in his studies of the effect of nutritive conditions on the weight and length of newborn children, gathered material from two years during which supposedly there was peace and plenty, and compared it with material gathered during two intervening years of famine. The fruitful years chosen were those of 1913 and 1923, and the intervening, those of 1918 and 1919. However, he divided his total material into several groups, making some of his figures quite small, and, therefore, his margin of error was so large that no decisive conclusions could be reached except in a few instances. For example, the female children of the married primiparas living in the city were definitely lower in weight in 1918 than in 1923; the male children of the married multiparas dwelling in the city were definitely lower in weight in 1918 than either 1913 or 1923, and the female children were definitely lower in weight during 1919 than during 1913, and definitely lower in weight in 1919 than in 1923. The children of married primiparas dwelling in the country were definitely lower in weight, as far as the boys were concerned at least, in 1918 than in 1913, and the children of married multiparas living in the country indicated that the boys of 1918 were definitely lighter than the boys of 1913.

These were the only definite conclusions allowed by the margin of error figured in each case. However, the arithmetical averages nearly always indicated that the children of both sexes and all conditions of life tended to be lighter in weight and shorter in length during the hunger years than during the years of peace, indications which might be verified on more extensive material.

Another indication that nutritive conditions might affect the weight and length of newborn children is exhibited in a graph in the original article, which shows that there were a greater number of overweight children born during the years of peace, and while a table (No. 13) shows that there was a greater number of children under 47.5 cm. in length born during the famine years. JOHN W. BRENNAN, M.D.

Hedberg, G. T.: A Case of Osteogenesis Imperfecta in a Newborn Child (Fall von Osteogenesis imperfecta bei einem Neugeborenen). *Acta obst. et gynec. Scand.*, 1941, 21: 270.

The mother of the child was twenty-nine years of age and a primipara. The child, a male, was in breech presentation, and the delivery and puerperium were normal. The child weighed 2,110 gm. but was only 37 cm. long. The extremities were strikingly short and lumpy as compared with the rest of the development. The hands and feet were well proportioned in comparison with the trunk, but not with the short extremities. Both humeri had an abnormal mobility, as in fractures of the diaphysis. Fractures were observed in the thighs and legs. The skull appeared to be normal, but on palpation it was very soft, and only the centers of the bones of the skull cap were firm, which indicated that most of the skull cap did not consist of ossified connective tissue. The sclerae of both eyes were bluish. Roentgenography revealed fractures of all the tubular bones. Because of a number of fractures in all stages the bones were more or less deformed—from recent fractures to those with more or less marked callus formation. The thighs, especially, were markedly deformed as a result of healing in severe malpositions. All of the ribs showed one or more fractures, often with considerable callus. The bones of the skull cap appeared as thin as paper and showed islands of bone only in places. The diagnosis was osteogenesis imperfecta congenita. As usual, the child lived only sixteen days, although its general condition was good during this time and it took on normal weight. On the sixteenth day the child became cyanotic and died. No autopsy was done.

The typical changes observed in osteogenesis imperfecta occur long before the birth of the fetus, and the latter is usually born dead prematurely in the eighth or ninth month. However, some fetuses have been born at full term and alive. These children, however, develop poorly without any previous special organic symptoms and often die suddenly without apparent cause. As the result of fractures and skeletal deformities these individuals look like dwarfs. The bony changes are often so pronounced that the bones are flexible and so soft that they can be cut with a knife. In pronounced cases the cortex appears as a membranous tube, consisting of periosteum or, in addition, some sparse bony tissue. The tubular bones contain a reddish-brown, soft bony mass and marrow. Microscopy reveals additional fractures in the vertebrae and the other bones. Roentgenographically, the bones in general, when not fractured and under other secondary influences, show a normal form. The skeleton, however, shows very poor roentgen shadows, which in pronounced cases are less dense than those of the soft parts. The cortex appears very thin, whereas the marrow cavity is very large and wide. Only when the callus is luxuriant are stronger shadows evident.

In explanation of the pathology, Weber claims that the formative process of bone has ceased at the point where the embryonal bone is resorbed and the lamellar layer should take its place. With the exception of a few layers in the vicinity of a few fractures he was never able to find any lamellar bone in the skeleton. Nor could he observe any

resorption processes, which indicates that lamellar bone was never formed. Similar changes occur in the dentine of the teeth, as the enamel, which is of ectodermal origin, always has a normal structure. Bauer and others believe that this defective mesodermal tissue formation is not limited only to the bony tissue, but affects the entire supporting tissue, affecting the last formed ontogenetic and phylogenetic hard substances most severely. Some cases have revealed atherosclerosis of the aorta, which would be explained by this theory. Cerebral hemorrhage and sclerosis of the arteries of the extremities have been observed also, the latter even roentgenographically.

Schmidt has called attention to the relationship between osteogenesis imperfecta and a form of bone fragility which at first appears in healthy individuals and is most often called osteopsathyrosis idiopathica. (This disease often appears in the English literature under the name of "fragilitas ossium"). Such a case of osseous fragility has been known to occur in three generations of one family, and both the fetal and the late forms have been known to occur in the same families. Blue sclerae are often associated with this condition, as well as difficulty of hearing due to otosclerosis. Both of these symptoms are known to occur in familial form. The bone changes in both osteogenesis imperfecta and in osteopsathyrosis are identical. They also have other common features, such as transverse and diaphyseal fractures with little or no pain and a tendency to good healing, often in malposition; the roentgenograms are also similar. Both diseases also show laxity of the ligaments with resulting luxations, and changes in the electrical excitability of the muscles. There is much in favor of the view that both of these forms of osseous fragility constitute one disease entity, in which individual cases of more severe nature show early symptoms and a poor prognosis, and others appear later, running a relatively smooth course with a good prognosis. There are also intermediate forms.

As to the etiology, some authors attribute the incomplete formation of bony tissue to a dysfunction of the osteoblasts, while others blame the hyperfunction of the "osteoclasts," and still others believe in a disturbed function of the endocrines, such as the thyroid, sexual glands, the pituitary, and the parathyroids. As a rule, changes in the calcium-phosphorus ratio of the blood have not been found. In view of the fact that congenital lues, tuberculosis, vitamin deficiency, and trophoneurotic factors may also be responsible, the true etiology is still a moot question.

The question of therapy is also unsettled, and various vitamins and endocrine preparations, and ray therapy are reported to have given good results. No definite results have been obtained with calcium-phosphorus treatment. A good result is reported from the administration of hydrochloric acid, a diet rich in calcium and phosphorus, and cod liver oil. However, since medication shows no definite results in this disease, the treatment is usually confined to orthopedic measures. LOUIS NEUWELT, M.D.

GENITOURINARY SURGERY

ADRENAL, KIDNEY, AND URETER

O'Conor, V. J.: Conservative Surgery of Hydronephrosis. An Analysis of Results Obtained by Various Procedures. *J. Urol.*, 1941, 46: 1051.

The conservative surgery of hydronephrosis due to obstruction at the ureteropelvic junction aims to restore or improve the urinary outflow from the renal pelvis so that renal function may be maintained or improved. This report does not include patients upon whom nephrolysis, pelviolysis, and ureterolysis were done. The author has done 36 plastic operations on 34 patients. In 2 patients a bilateral operation was done. In 2 patients pyeloplasty was successfully performed upon a congenital solitary hydronephrosis. In 5 of the 34 patients the opposite kidney presented functionless hydronephrosis and was removed after a successful pyeloplasty was demonstrated on the functioning side.

The surgical procedures adaptable to relieve hydronephrosis by improved renal drainage through pyeloplastic technique are classified as follows: (1) end-to-side anastomosis of the ureter to the renal pelvis (described by Kuester but improved by Quinby and others); (2) the transverse suture of a longitudinal incision (Fenger's use of the Heineke-Mikulicz principle); (3) the pyloroplastic technique of Finney as a pelvioureteroplasty (with variations by Young and others); (4) the Rammstedt pyloric operation applied to the constricted ureteropelvic junction; and (5) the Y-plasty of Durante as applied to the pelvioureteroplasty of Schwyzer and improved by Foley.

Several other points of technique have been proposed and are the subject of much discussion, such as, (1) plication in large extrarenal pelves; (2) excision of large areas of redundant pelves in extrarenal hydronephroses; (3) splinting the repaired area during the healing period; (4) postoperative renal drainage by pyelostomy or nephrostomy or by both; (5) division of the adjacent aberrant arteries or veins and (6) suspension and fixation of the kidney after the pyeloplasty has been completed.

In this study the cases were followed up for a period of sixteen years to six months postoperatively. All were checked symptomatically for over a year. The results were as follows: 6 patients in whom the ureter was divided and reimplanted in the pelvis showed roentgenographically satisfactory results as to improved function and mechanical drainage. In 3 of these the neostomy was splinted for from eleven to twenty days. Roentgenographically the splinted cases showed much more satisfactory results at the pelvis outlet than those not splinted. All 6 cases were drained by nephrostomy.

Three patients operated upon by Fenger's application of the Heineke-Mikulicz technique showed normal emptying time of the renal pelvis and decreased pyelectasis; the patients were clinically well. In 1 case a large area of the redundant pelvis was excised. However, the decrease in size of the pelvis roentgenographically was even more satisfactory in 2 cases in which no pelvic tissue was excised. All 3 cases were drained by pyelostomy. On the basis of more recent experience the author does not intend to employ this technique in the future.

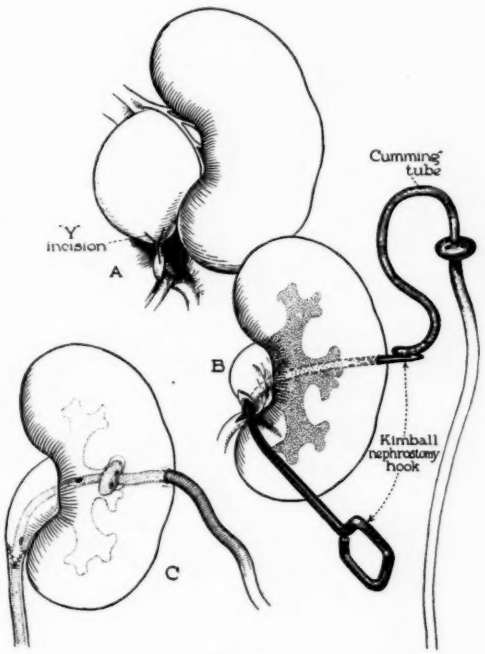

Fig. 1.

Two patients were operated upon by the Finney type of pelvioplasty. One of these died of septicemia and pneumonia as a result of renal infection from inadequate pyelostomy drainage. The second patient, after eleven years, has an unsatisfactory functional and roentgenographic result, and later nephrectomy may be necessary.

Seven patients were operated upon by the anterior Y-plasty of Schwyzer. Unfortunately it often does not properly correct the high insertion of the ureter and in these cases the Foley technique of the posterior Y-plasty corrects this condition. By the use of the Cumming tube and ready access to the ureteropelvic junction the anterior Y-plasty technique is rapid and simple (Fig. 1). Five of the 7 patients showed very satisfactory results in postoperative studies, as well as complete clinical relief.

Eighteen patients were operated upon by the posterior Y-plasty of Foley. In all of these the pelvis was splinted and the kidney drained by a nephrostomy tube for from two to four weeks. Both bilateral cases were in this group. In 1 case a very satisfactory clinical result was obtained in both kidneys. In the second bilateral patient an excellent result was obtained in one kidney, but in the other a permanent nephrostomy tube had to be maintained. Both hydronephroses were massive and severely infected. One man, previously instrumented elsewhere for infected hydronephrosis, died of pulmonary embolism after a posterior Y-plasty. Of the remaining 13 patients, 5 of whom had a later nephrectomy on the opposite side, 11 have been thoroughly checked roentgenographically and otherwise, and 9 of these show most satisfactory results. Two had unsatisfactory results as to improved pelvic outline and renal function. In 1 of these a rather sizable artery of the lower pole was divided and renal infarction resulted. In a future similar condition the author would resect the ureter and reimplant it in the pelvis, avoiding ligation of the polar vessels. Before dividing any artery to the kidney one should thoroughly compress its lumen and observe the degree of parenchymal anemia. Practically all arterial supply is segmental and not collateral, as shown by this test.

From the author's experience in these cases he concludes that the Y-plasty, either anterior or posterior, is the operation of choice except in the presence of anomalous or aberrant vessels; also, a too narrow ureteral lumen at the outlet make these procedures obviously impossible. In this group the Kuester-Quinby technique was the one of choice. In the author's hands, splinting of the ureter and nephrostomy drainage are the technical procedures of choice, but he would not splint either a soft, mushy infected ureteral region or one which is so densely sclerotic as to be practically avascular.

LOUIS NEUWELT, M.D.

Allen, F. M.: Acute Hypertension with the Clamping or Ligation of Explanted Kidneys. *J. Urol.*, 1941, 46: 834.

The author presents a series of experiments and concludes that the typical effect of clamping or ligation of explanted kidneys is an acute hypertension which persists throughout the period of asphyxia. This acute hypertension occurs also from asphyxia of only one kidney. It can be superimposed upon an existing chronic hypertension. Restoration of the circulation is followed by a rapid fall to the original pressure or even lower.

The nervous character of this hypertension is evident from its occurrence during a time when humoral factors from the kidney are excluded. At least with any duration of asphyxia which is compatible with survival of the animal, the nervous factor is completely dominant, and there is no sign of secondary hypertension due to the flushing out of hypothetical hypertensive substances after the re-establishment of the renal circulation.

The nervous mechanism concerned in the hypertension was investigated only to the extent of experiments with general and local anesthesia. A psychic component is evidenced by the higher pressures in nervous excitable dogs as compared with quiet passive ones. A definite though less marked hypertension still occurs when the psychic factor seems to be eliminated by anesthesia. The most probable interpretation of the available facts points to a nervous reflex element in the hypertension, which occurs as long as a reflex response is possible.

When the renal asphyxia is continued for a period beyond any possible physiological limits, for example six hours, a rather brief secondary hypertension may ensue. Apparently this result does not occur except when the asphyxia, of both kidneys or of 1 kidney, has been so prolonged as to cause a rapidly fatal intoxication. Possibly, therefore, any toxic asphyxial products in experiments of this type may be of postmortem character and not representative of anything occurring physiologically or clinically.

The experiments with explanted kidneys, though involving complex factors, illustrate the complex control of the blood pressure in the intact organism. Within time limits which can reasonably be considered physiological, for example from two to four hours, hypertension from substances supposedly produced during renal asphyxia either is nonexistent or is nullified by the predominant nervous control. Therefore, without denial of the reality or the value of the observations under nonphysiological conditions, there is a warning against attempts to expand the artificial findings into a universal theory of hypertension.

D. E. MURRAY, M.D.

Shivers, C. H. deT., and Mathis, J. H.: A Clinical Study of 2 Unusual Types of Renal and Ureteral Disease. *J. Urol.*, 1941, 46: 1079.

The authors present and discuss the diagnosis and treatment of two very rare urological conditions.

Autopsy reveals the presence of ureteral duplication in 3 or 4 per cent of patients. Complete duplication is more common than incomplete.

Females show a greater tendency toward duplication than do males. Most embryologists agree that complete unilateral duplication of the ureter and pelvis is due to the formation of two outgrowths from the mesonephric duct on one side, instead of one, as is normally the case.

The first case represented a unilateral complete duplication of the ureter and pelvis complicated by an intravesical cystic dilatation of the ureter to the upper pelvis within which were three calculi.

It is believed that the patient developed some dilatation of the intravesical portion of the supernumerary ureter as a result of the constricted orifice, and that a ureterocele formed. The diagnosis was verified and operation was performed by opening the bladder suprapubically. The ureters were removed from the cystic dilatation, the entire sac was excised, and both ureteral orifices were brought out through the upper opening in the bladder mucosa.

The histological picture was that of marked bullous edema with a rapid disintegration of the surrounding tissue without evidence of local infection. There was a complete absence of transitional epithelium, but the presence of a few scattered bands of unstriated muscle suggested that at least a portion of the ureteral wall remained.

Postoperative examination of the bladder four months later revealed a normal bladder. Below the right angle of the trigone there was a depressed area at the site of operation, bridged by a narrow margin of mucosa at its lower portion. At the upper margin of this area there were two ureteral orifices, one almost immediately above the other, the lower one slightly medial to the upper orifice. These orifices showed prompt excretion of dye with equal and marked intensity. Both ureters were easily catheterized.

The second case to be presented was an unusual condition called hydrocele renis. In this condition the kidney was surrounded by subcapsular fluid derived from three sources: renal, hemovascular, and lymphovascular. The condition is due to renal trauma, perirenal inflammation, lymphatic, or urinary obstruction. In the case presented it was believed that the capsule, which extended for some distance over the renal pelvis, was filled with extravasated urine from a rupture of the renal pelvis.

The patient, a young woman nineteen years of age, was admitted to the hospital because of a persisting dull aching pain in the region of the right kidney, followed by chills and fever. There were no other urinary symptoms. The temperature was 104, the pulse 120, and respiration 24. At cystoscopy, ureteral obstruction was found on the right side 26 cm. from the bladder. A continuous flow of urine was noted from the catheter, which was left *in situ* for drainage. X-ray examination revealed two shadows in the region of the right renal pelvis. She was completely relieved in two days. She refused any operative procedure and was discharged. Three months later she was admitted to the hospital with the same type of history. All tests revealed some damage to the right kidney. A bilateral pyelogram revealed a normal left renal pelvis and a hydronephrosis involving the right kidney, with two shadows resembling renal calculi. Operation was decided upon because of the persistent pain. At operation the true renal capsule was found to be separated from the parenchyma except at its attachment to the renal sinus. The capsule was thin and there was a considerable amount of amber-colored fluid beneath it. Nephrectomy was done because of the large amount of fluid, the exact nature of which was unexplainable. The patient made an uneventful recovery.

The gross examination of the kidney showed that the capsule had been separated from the parenchyma and that it contained a quantity of fluid. There were two stones found in the pelvis of the kidney. It is impossible to state whether or not the hydrocele renis was produced by rupture of the pelvic portion of the kidney into the capsule at this point, or whether it was produced by some other method. There was, however, a chronic pyelonephritis with a chronic suppurative exudate contained within the collecting tubules.

It is the opinion of the operator that there was first an acute pyelonephritis prior to operation, due to a partial obstruction caused by a calculus lodged at the ureteropelvic junction, which resulted in temporary hydronephrosis with infection. It is the belief of the clinician that the attack preceding the nephrectomy was due to a small rupture in that portion of the pelvis covered by continuation of the renal capsule, which permitted the subcapsular extravasation of urine. Only 6 cases of hydrocele renis have been reported previously. ELMER HESS, M.D.

Creevy, C. D.: Nephrolithiasis Due to Infection with the Bacillus Proteus. *Surgery*, 1941, 10: 971.

Thirteen cases of nephrolithiasis secondary to infection by the bacillus proteus have been reported. The organism, resident in the bowel, is usually introduced into the urinary tract by or through the catheter. Ammonia from the urea of the urine is formed, which alkalinizes the urine and precipitates the phosphates and carbonates of calcium, ammonia, and magnesium, especially in the presence of stasis, recumbency, and increased excretion of calcium.

In 11 of the 13 patients (84 per cent), the organism is known to have been introduced by catheters, usually employed for nephrostomies or cystostomies. In 2, congenital anomalies of the urinary tract were present. In 8 (70 per cent), the calculi were bilateral; in 2, the infection grew very rapidly under observation. Five (38 per cent) of the patients died, 4 as a direct result of the infection and lithiasis, and 1 from a surgical accident.

Treatment was entirely futile in the earlier cases; however, there has been a gradual improvement for four reasons: the development of effective urinary antiseptics (sulfanilamide and especially sulfathiazole) and the citrate-citric-acid irrigant; a clear understanding of the mode of entrance of the organism into the urinary tract; an appreciation of its extraordinarily serious potentialities; and comprehension of the role of predisposing factors such as stasis and recumbency.

As a result, 7 patients have been apparently cured of the infection, and 6 have been cured of the stone-forming tendency by a combination of operation and sulfonamide treatment, and, in suitable cases, irrigations with citrate-citric acid.

Three cases must be classified as cures more or less by default, since 2 cures followed nephrectomy for unilateral disease, and 1 cure occurred spontaneously after the removal of calculi. Two of the "cured" patients have the escherichia coli but not pus in the urine, and 1 has calculi in the unoperated segment of a double kidney, these stones apparently having started before the organism was eradicated.

The real solution of the problem lies, however, not in removing stones, relieving stasis, and curing infec-

tion, but in preventing the entrance of the organism into the urinary tract by adequate, painstaking, and persistent attention to the proper sterilization of catheters and their adjuncts, to their aseptic introduction and fixation, and, above all, to the proper care of systems draining urine from the body. To this end, educational activities by informed urologists are imperative. JOHN A. LOEF, M.D.

Korhonen, A.: The So-called Solitary Renal Cysts, Their Histogenesis and Pathogenesis (Ueber die sog. solitaeren Nierenzysten, ihre Histo- und Pathogenese). *Acta Soc. med. Fennicae Duodecim*, 1941, Ser. B. 27: Fasc. 3.

Impelled by the consideration that the solitary kidney cyst is not reported frequently, and that, due to the difficulties of diagnosis, many cases must escape operation, the author reports 4 cases from his Finnish material in which the peculiar difficulties of diagnosis are exemplified and in which the histological findings seem to hint at a solution of the problem of their origin.

The first patient was a forty-four-year-old man with abrupt urinary symptoms, severe renal pain, and hematuria, of whom retrograde urography suggested some form of tumor of the lower pole of the left kidney; in the second case, that of a man of forty-eight years, a tumor in the right kidney region had been progressively increasing in size for about a year, producing mild intermittent pains but no other symptoms; in the third case, that of a woman of forty-six years, there had been symptoms of pain and other urinary disturbances for six years, and recently a painful enlargement of the left kidney had occurred. Puncture released 50 cc. of a thin, yellowish, clear, odorless fluid containing substances suggesting its urinary character. The fourth patient, also a woman, forty-four years of age, had suffered for years with symptoms of mobile kidney, and recently a sensative enlargement of the left kidney was demonstrated. Intravenous urography suggested a cyst in the upper pole, connecting with the pelvis of the kidney.

Histological studies of the removed kidneys or specimens revealed the well known fact that the solitary kidney cyst is not always solitary—it may be multiple. In the first case there were 3 cysts present and in the third case 2. None of the specimens exhibited a lining membrane; all were within the kidney substance or immediately adjacent, and none of them connected with the urinary tract, with the exception of the cyst in the upper pole of the left kidney in Case 3. All were surrounded by a rather loosely woven capsule, in places meager, in places abundant. There was present in all cases some evidence of embryonal developmental disturbances in the kidneys, such as degenerative processes in the glomeruli, sclerotic vascular changes, focal proliferations of the connective tissue, inflammatory foci, extravasation of blood in the parenchyma, fasciculi of muscle fibers in the cortical part, spongy embryonal connective tissue, and thin endothelial tubes.

One urographic sketch and three microphotographs are given in the original article.

JOHN W. BRENNAN, M.D.

Rudström, P.: A Report of a Renal Cyst with Concrement Formation of a Peculiar Character (Ein Fall von Nierenzyste mit eigenartiger Konkrementbildung). *Acta chirurg. Scand.*, 1941, 85: 501.

The author reports 2 cases, the first of a man of thirty and the second of a boy of seventeen, who came to pyelography with indefinite, not urologically characteristic symptoms of general abdominal pains and tenderness to pressure. In the first patient they were of an intermittent nature and had been present for several weeks. Apparently a small cyst within the renal tissues was demonstrated in each patient; in the first patient the abnormal shadow was demonstrated by means of the simple x-ray plate and was diagnosed a renal stone. In both cases a connection with the renal pelvis could be assumed; however, the author believes that this connection was not original but was recently acquired because of rupture of the cyst in each case. Repeated search for tubercle bacilli was always fruitless.

The first case was especially significant in that the shadow of the concretion in the cavity of the cyst disappeared within a few days, coincident with the discharge of a large number of small concretions.

Microscopic examination of the extruded stones disclosed a protein stroma with a thick lamellar shell of secondary calculous incrustations and an inner structure of concentric radiating character, with an illy-defined amorphic nucleus. The encrusting salts were chiefly triple phosphate of calcium, with small amounts of calcium carbonates; other constituents, such as magnesium, ammonium combinations, and lipoids, were of no significance.

The author assumes the following processes to be the cause of the concrement-formation: with the bursting of the cyst into the renal pelvis, there was an intrusion of urine into the cyst cavity with favorable conditions for stone formation (pH, concentration of salts, colloid relationships); this resulted in aseptic stimulation by the urine, and produced centers of crystallization of the crystalloids present, with later cohesion by means of the colloids.

The author believes that such an assumption offers support to the older crystalloid theory of the genesis of stone as distinct from the more recent school of thought favoring colloid conditions as the primary and essential factor in calculous formation within the body. JOHN W. BRENNAN, M.D.

Mertz, H. O., Howell, R. D., and Hendricks, J. W.: The Limitations of Irradiation of Solid Renal Tumors in Children. *J. Urol.*, 1941, 46: 1103.

While the marked sensitivity of many solid renal tumors in children to the irradiation type of treatment early lent encouragement to its use, the failure of other tumors to be influenced appreciably by irradiation and the frequent return of the tumor mass after a primary recession in size, soon empha-

sized its limitations. As a result, irradiation remains but an adjuvant to the extirpation of the kidney as a preoperative and postoperative measure. Nevertheless, instances of apparent clinical cure following irradiation alone have been reported. The clinical results in these isolated cases suggest that a close study of the problems in the administration of the x-rays by the roentgenologist and careful postoperative or postmortem study of the kidneys so treated by the pathologist might explain these occasional successes.

For the past four years irradiation has been the method of election in treating renal tumors at the James Whitcomb Riley Hospital for Children, Indianapolis, Indiana. The treatments were continued until the authors were convinced of their futility, until physical findings or clinical symptoms indicated a renewed activity and the need for nephrectomy, or until death occurred. Close co-operation between the departments of urology, radiology, and pathology was maintained at all times.

Fifteen children with renal tumors were observed. A renal tumor with tuberous sclerosis, a chloroma of the kidney, and 2 cases of Wilm's tumor were not irradiated. The size of the tumor mass in 3 cases of cystic tumor was not lessened by irradiation in any instance. One of 2 patients with congenital polycystic disease had irradiation with no decrease in the size of the tumor. In 3 patients the size of the tumor was diminished by irradiation and all 3 died with a palpable loin tumor. X-ray therapy was incomplete and unsatisfactory in 2 patients because of lack of co-operation. The records of only 3 patients with solid renal tumors were sufficiently complete to justify their report and these form the basis of this article. Case 1 was an embryonal adenomyosarcoma, Case 2 was metastatic embryonic adenomyosarcoma of the bladder from a primary renal tumor, and Case 3 was an embryonal adenocarcinoma of the kidney.

The radiosensitivity of the tumor in Case 1 is unknown. Marked gastrointestinal disturbances followed each attempt at irradiation and were not affected by changes in the technique; therefore this form of therapy was abandoned. The marked sensitivity of the tumors in Cases 2 and 3 well illustrate the false security engendered by the disappearance of the mass and the return of the pyelogram to normal following irradiation. In Case 2 after 2 series of treatments, totaling 7,000 roentgens as a tumor dose, and in Case 3 after a tumor dose of 9,900 roentgens, the pyelographic findings approached normal and no mass was palpable. Yet in Case 2 after a total tumor dose of 9,216 roentgens and nine months following the diagnosis there was a recurrence of hematuria with a palpable tumor mass in the abdomen and metastatic tumor deposits in the bony pelvis, about the rectum and in the bladder. The recurrence was delayed in Case 3 and two months after the completion of the eighth series of treatments with a total of 13,105 roentgens as a tumor dose and two years after the diagnosis was made, hematuria developed with pyelographic evidence of a recurrence of tumor activity.

Irradiation was ineffective in the treatment of the recurrent tumors in the loin and the metastatic tumor in the bladder. This conforms to the usual behavior of such secondary tumors and indicates that while the type of tumor tissue remains the same, a change has occurred either in the individuality of the cell or in the vascular architecture of the tumor. Probably the presence of extrarenal extension of the growth or metastatic lesions overlooked when treatment is instituted may account for many cases of failure from irradiation. This fact would suggest wider distribution of the portals of entry, not limitation to the three usually employed, as was the case in the authors' series.

In Case 3 there were definite changes in the vascular and secretory structures of the uninvaded portion of the left kidney. These were so extensive that there was but little functional value left to this part of the kidney. There was no evidence of any decrease in function of the right kidney. With a dosage of 100 roentgens it would seem that while the secretory function of the affected kidney might be destroyed when treatments extend over an extremely long period, there is probably no lasting damage to the good kidney.

The skin of the child tolerates the treatment well and will probably seldom be the cause for alteration of any plan of radiation therapy. The amount of irradiation given these patients is probably greater than that usually employed. The failure to control the growth and prevent renewed activity need not condemn the procedure, but may indicate the need for more irradiation to the local lesion. If the maximum effect of irradiation is to be secured and the possibilities of this treatment are to be exhausted, the total dosage must be increased over that used at present.

The further management of the authors' patients will be based upon the hope that a more continuous administration of x-rays, with minimal periods of rest, given over an indefinite period, and uninfluenced by local or pyelographic evidence of an apparent return to normal, may decrease the high mortality of this disease when surgery alone, or surgery preceded by irradiation sufficient to decrease the size of the growth, is employed. In the authors' experience postoperative irradiation of the child or of the adult, who has had a renal tumor removed, has given no definite evidence of benefit. It is possible that insufficient treatment with too long intervals between treatments is responsible for failures to prevent recurrence.

The authors believe that more careful consideration of the details of irradiation may be followed by improvement in the therapeutic results. Reports of failures such as recorded here must not necessarily be interpreted as evidence of inadequacy of the treatment as they could easily be the result of improper administration. The disappearance of physical and pyelographic evidence of the disease is prone

to create an unwarranted sense of security in the minds of both the patient and the doctor and result in a relaxation of continued aggressive irradiation.

The future status of x-ray therapy in solid renal tumors in children will be determined best by close co-operation between the roentgenologist and the urologist. A revision of the present methods of treatment should be met open-mindedly by each.

LOUIS NEUWELT, M.D.

Hess, E.: Intracystic Reimplantation of the Ureter. *J. Urol.*, 1941, 46: 866.

The author presents a case of ureteral obstruction which was not amenable to the usual methods of dilatation. Since the kidney retained normal function, the author believed that an attempt should be made to preserve the organ, and at first it seemed necessary to resort to reimplantation of the ureter as described by Young, Lowsley, and Kirwin. However, a simple and easy surgical technique was devised, and although this method has been used only once, the results were successful and the technique is offered for consideration.

D. E. MURRAY, M.D.

BLADDER, URETHRA, AND PENIS

Herger, C. C., and Sauer, H. R.: The Occurrence and Clinical Course of Radium Reactions Following the Use of Radon Implants in the Treatment of Carcinoma of the Bladder. *J. Urol.*, 1942, 47: 141.

Herger and Sauer present a detailed and comprehensive study dealing with interstitial radium ir-

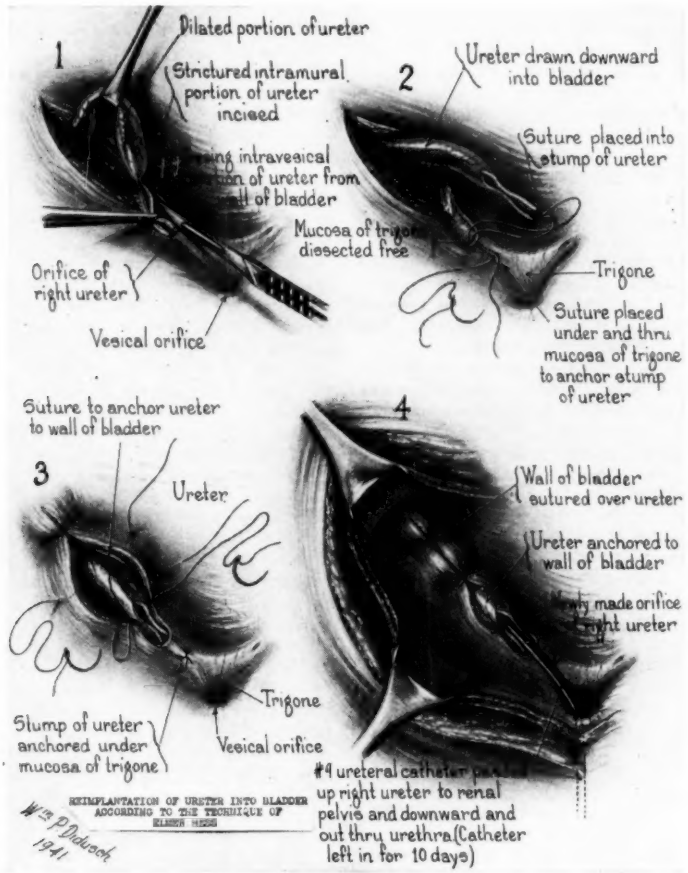
1
Dilated portion of ureter
Strictured intramural portion of ureter incised
Orifice of right ureter
Vesical orifice
2
Ureter drawn downward into bladder
Suture placed into stump of ureter
Mucosa of trigone dissected free
Trigone
Suture placed under and thru mucosa of trigone to anchor stump of ureter
3
Suture to anchor ureter to wall of bladder
Ureter
Trigone
Stump of ureter anchored under mucosa of trigone
Vesical orifice
4
Wall of bladder sutured over ureter
Ureter anchored to wall of bladder
#9 ureteral catheter up right ureter to renal pelvis and downward and out thru urethra (Catheter left in for 10 days)
REIMPLANTATION OF URETER INTO BLADDER ACCORDING TO THE TECHNIQUE OF ELMER HESS
Wm. P. Didusch 1941

Fig. 1.

radiation in the treatment of bladder tumors; the study includes a ten-year follow up of 229 patients, with special emphasis on the effects which radium in the form of radon implants can produce.

Late radium reactions were observed in comparatively few cases, such being 4 cases of stricture of one ureter and 4 cases of bleeding telangiectases. With regard to the development of immediate radium reactions, ulcer formations in the bladder were encountered in 187 cases.

It was noted that the location of the tumor is important as far as the occurrence and clinical course of radium ulcerations are concerned. Tumors originating in and around the region of the internal vesical orifice do not tolerate radon irradiation very well. Tumors originating in the center or border of the trigone proved to have a substantial tendency toward persistence of the ulcerations formed. However, ulcers are less likely to occur, and if they do occur, they heal more favorably if the tumor is located in the posterior or anterior bladder wall. The smaller the ulcer, the more favorably it may heal. In no case did an ulcer larger than 3 cm. in diameter heal. DONALD B. DOUGLAS, M.D.

Graves, R. C., and Guiss, L. W.: Tumors of the Urethra. *J. Urol.*, 1941, 46: 925.

The authors mention the infrequency of urethral carcinoma and state that in 14 years at the Pondville Hospital in Massachusetts (an institution for the study of neoplastic diseases) there have been in 19,000 admissions only 10 cases of urethral malignancy in the female and 1 in the male.

Benign papillomas, in the experience of the authors, are common in the male. Symptomatically they are characterized by either distortion of the urinary stream or bleeding. They characteristically recur following excision, cauterization, or fulguration. To prevent such recurrence more adequate destruction of the base is advocated. Hence, these lesions are to be treated by radium implantation to the base with seed or needle following biopsy and coagulation. In the male urethra a cervical or uterine brass silver capsule is introduced to cover the tumor. The scrotum is protected with leaded rubber, and the dose recommended is 200 mc. hours. A case is reported depicting the use of radium in a male who had no recurrence after four years and eight months.

Malignant tumors of the male urethra are rare and the literature reveals but 150 reported cases. Kreutzmann and Coloff have reviewed the literature and found the following distribution of the lesion in the urethra: 65 per cent in the pendulous portion and 77 per cent proximally. The age incidence varied between fifty-one and sixty years and 76 per cent of the cases revealed a history of previous stricture. Kreutzmann and Coloff describe the malignancy which occurs in the posterior portion of the urethra as being characteristically like an abscess of the perineum about the size of a walnut with anteroposterior elongation located in the median raphe 2 cm. posterior to the penoscrotal angle. The mass is tender red and has a small pin point opening which discharges a thick purulent material. The abscesslike mass may heal and recur, or be stubborn to healing and even discharge a few drops of urine due to a fistulous opening into the urethra. Symptomatically the lesion causes urinary-tract irritation, i.e., burning and frequency, and disturbance of the caliber of the urinary stream. Hematuria is most pronounced following instrumentation. A lesion of the penile urethra is often detected by the patient as an ulcer or nodule when the disease is less advanced, and the diagnosis is dependent upon urethroscopy, biopsy, and urethrography. Kreutzmann and Coloff reported 54 per cent recovery in penile lesions as compared to 13 per cent in lesions of the deeper urethra. The treatment of choice was resection of the urethra and in penile involvement complete or partial amputation of the penis along with radical resection of the groins.

The authors report their single case of urethral neoplasm in the male. The patient was forty-four years old and developed a perineal mass fourteen months before the authors saw the patient. During this time the perineal mass was twice incised and finally a suprapubic cystotomy was done to permit adequate vesical drainage and relieve the patient's urinary symptoms of burning, frequency, and hematuria. Five months after the appearance of the perineal mass the patient suddenly developed a painful left arm which progressed to suppuration and an acute osteomyelitis. Though metastasis was considered it could not be substantiated by microscopic examination of the surgical material. High-voltage x-rays to the perineum afforded little relief and the malignant process finally extended to the rami of the pubic bones. The cause of death, fourteen months after onset, was an intercurrent infection. The lesion was diagnosed as an epidermoid carcinoma, Grade I, of the urethra with invasion of the prostate.

The authors, as stated previously, saw 10 cases of primary urethral neoplasm in the female. The majority of these malignant new growths were epidermoid carcinomas, occasionally adenocarcinomas, of the paraurethral glands, and rarely sarcoma. Chronic irritation seems to be the most common etiological factor, although other predisposing factors recorded were: chronic infection, leucoplakia, prolapse, caruncle, and scars of childbirth.

The prominent symptoms of this condition are urethral bleeding, painful urination, and urethral obstruction. The diagnosis can be made by inspection and biopsy since the lesion is usually superficial in the distal urethra. Lesions along the course of the urethra can be diagnosed by vaginal examination, urethroscopy, and biopsy. The authors warn that it is often necessary to obtain more than one biopsy specimen in order to establish the diagnosis.

The authors review the various methods of treatment used since 1912 when Whitehouse advocated wide excision of the urethra and the inguinal glands.

Since that time the therapy has passed through the preradium era to the present day electrocoagulation in combination with radium and roentgen therapy. It is concluded that the following therapeutic routine is most efficacious. Irradiation rather than surgical excision in early and moderately advanced cases of epidermoid carcinoma and surgery only for such growths which involve the major portion of the urethra, particularly adenocarcinomas.

ROBERT LICH, JR.

GENITAL ORGANS

Huggins, C., Scott, W. W., and Hodges, C. V.: Studies on Prostatic Cancer. The Effects of Fever, of Desoxycorticosterone, and of Estrogen on Clinical Patients with Metastatic Carcinoma of the Prostate. *J. Urol.*, 1941, 46: 997.

The authors refer to previous articles in which they have presented evidence that carcinoma of the prostate is responsive to depression of the level of androgenic hormones in the organism. Also, the factors which reduced the androgenic phase were found useful in the clinical management of prostatic cancer. Previously reported were 21 cases which were treated by castration for advanced carcinoma of the prostate. In 17 improvement was noted by tumor regression, increased appetite, gain in weight, improved hemic component, and decrease in pain. Complete regression of the tumor did not occur, but a definite depression of tumor activity with a resultant improvement of the patient. The present article is concerned with methods for the depression of androgenic activity especially when it may be produced in extragonadal loci.

In the opinion of the authors studies on serum phosphatase are a satisfactory index for androgenic activity or formation in the patient with cancer of the prostate. The phosphatase level drops usually following castration and when it does not there is reason to believe that androgens may be formed in the adrenals. Since desoxycorticosterone acetate has been known to cause adrenal enlargement it was tried to reduce the phosphatase, but it failed. However, estrogen did depress the phosphatase level markedly, and following the discontinuation of stilbesterol therapy the condition reappeared. Fever causes a similar lowering of the phosphatase in the blood, and there is a return to the previous level when the fever subsides. The action of estrogens in androgen activity is still problematical and many theories have been advanced.

In this communication the authors discuss 4 cases in which castration did not reduce the serum phosphatase more than 10 units. Therapy with desoxycorticosterone acetate did not affect the enzyme level, but stilbesterol in 1 case caused a reduction below the minimal level effected by removal of the testes. The dangers of estrogenic therapy are discussed. Also, the administration and withdrawal of stilbesterol caused marked fluctuations in the phosphatase level.

It is suggested that advanced cancer of the prostate be treated by castration after the determination of the serum phosphatase level. If the phosphatase level does not reach a low level, estrogen therapy should be used to inhibit the neoplastic process. That this therapy is not a cure, but only a measure to effect satisfactory clinical management, is reemphasized.

ROBERT LICH, JR.

Kenyon, A. T.: Problems in the Recognition and Treatment of Testicular Insufficiency. *New England J. Med.*, 1941, 225: 714.

The author points out that testosterone does not enhance the sexual drive in normal males although it incites hypernormal excretion of urinary androgens and nitrogen retention. Following castration in the adult man, or after discontinuance of effective androgen therapy in the hypogonad, the deep voice remains, the penis may not recede, and the genital, trunk, and facial hair fall out slowly and irregularly; however, considerable amounts of inactive prostatic tissue remain palpable. Hence, diminished testicular secretion may go on for long periods without detection of these unquantitative physical characteristics. The therapeutic test of administrating androgens is at present the only clinically applicable method of detecting individuals with impaired testosterone secretion.

The author recommends for the sexually impotent who do not respond to a course of psychotherapy, the administration of 25 mgm. of testosterone propionate intramuscularly thrice weekly, or of from 50 to 100 mgm. orally, daily for three weeks. During these periods the semen should be examined since these dosages may often reduce or even cause a disappearance of the spermatozoa, and such dosages must be sought which will avoid this undesirable effect. If androgenic therapy is without avail more elaborate psychotherapy is indicated.

The somatic effects of testosterone propionate are alleged to be: (1) an increased metabolic rate, (2) an increased body weight, (3) an increased nitrogen, phosphorous, potassium, sodium, and chloride retention, (4) a diminished urine output, (5) an increase in total muscle mass, and (6) an increase in height of hypogonadal boys.

Clinically, the author points out, the androgens benefit Cushing's syndrome, hypopituitarism, and the debility of the aged symptomatically. No case reports are cited, but it is suggested that the somatotropic properties of the androgens offer a new and little explored field of therapeusis.

ROBERT LICH, JR.

Campbell, H. E.: The Incidence of Malignant Growth of the Undescended Testicle. A Critical and Statistical Study. *Arch. Surg.*, 1942, 44: 353.

The author has made a research in the literature and demonstrated conclusively that the undescended testicle is more liable to malignant change than the normally placed testicle and that the abdominal testicle is especially subject to neoplastic trans-

formation. The reason for past diversity of opinion on this subject is pointed out by the author to be due to several factors:

1. The medical profession has neglected the science of statistics; it has tried to draw conclusions from figures without knowing how to manage them.
2. Medical authors have committed almost incredible errors of misquotation.
3. Misinterpretation has led to false conclusions.
4. The authors have neglected a composition of figures from private and hospital practice.
5. The failure to realize that early work in the field did not recognize tumors arising from the intra-abdominal testicle.
6. The incidence of testicular malignancy has been computed on the number of testicles in this study, and this reveals the true value to malignant change in bilateral undescended testicles, a point heretofore never followed.

It is suggested that the use of the statistical method for case study has been sadly neglected and this factor alone has led to erroneous conclusions. The author points out numerous misquotations that have been reiterated from author to author and that many of these misquotations are based on misinterpretation of terminology used in the original article.

Cryptorchidism is considered to refer to "a condition in which the testes fail to descend normally," a cryptorchid being "one affected with cryptorchidism," and ectopy may be used synonymously with cryptorchidism, but usually refers to perineal, penile, and femoral locations of the testes.

In an anlysis of 505,000 hospital admissions collected from the literature the author presents the conclusion on a statistical basis that testicular nondescent is more liable to malignant change. He qualifies this statement by the remark "that this does not prove that the malposition caused the malignant change. It merely indicates that the difference is greater than one would expect from chance that thus there is some causal agent operating."

In an analysis of the reported cases the author finds that the ratio of malignancy in the abdominal testical is approximately 1 to 20 while in the inguinal it is 1 to 80. Although figures in the literature show equal numbers of malignant growths in both abdominal and inguinal gonads, the fact that the proportion of inguinal to abdominal testes is about 4 to 1, while that of cancerous inguinal to cancerous abdominal testicles is about 1 to 4, is not appreciated.

It is also pointed out that in the general male population the incidence of nondescent is 0.23, and the incidence of nondescent in testicular neoplasm is 11.0 per cent; 41.3 per cent of the malignant growths are retained abdominally.

The author concludes from this statistical study that the practice of placing the inguinal testicle within the abdomen should be abandoned, and if the gland cannot be placed within the inguinal canal or scrotum excision is indicated. Neoplastic processes of the intra-abdominal testicle proceed to an inoperable condition before the patient is aware of any enlargement. In the event of bilateral retained testicles in the abdomen, the left is usually found closer to the internal inguinal ring; hence this one should be brought into the canal, and if the right gonad cannot be transposed from the abdomen it should be excised. It is not advocated to castrate an individual to prevent cancer, but still it is considered reasonable to bring one or another, if not both, testicles into the inguinal canals so that they can be observed for malignant changes. ROBERT LICH, JR.

MISCELLANEOUS

Rake, G., Shaffer, M. F., Grace, A. W., McKee, C. M., and Jones, H. P.: New Aids in the Diagnosis of Lymphogranuloma Venereum. *Am. J. Syph., Gonor. & Ven. Dis.*, 1941, 25: 687.

The authors, after reviewing the literature on diagnostic aids for lymphogranuloma venereum, discuss the preparation, method of using, and applicability of lygranum and a serological procedure.

Lygranum is prepared by inoculating the chick embryo yolk sac with material containing the causative agent of lymphopathia venereum. The antigen is then harvested from the yolk sac of moribund or recently dead chicks. The material is emulsified in saline solution, differentially centrifuged, diluted to 200 times the original yolk sac volume and inactivated with phenol and formalin. The intradermal injection consists of 0.1 cc. and the results are read in forty-eight hours.

The complement-fixation test is executed with both mouse-lung preparations and yolk-sac antigen. The former is prepared in the usual manner and the latter similarly to the manner described for intradermal use. The nonspecific inhibition of complement activity exhibited by antigens containing formalin concentrations of 0.1 per cent or more are eliminated by saline dilutions. Essentially the technique of serodiagnosis includes the use of inactivated human sera, guinea-pig serum, and the specific antigen. Sensitized sheep erythrocytes are used as the indicator and the authors' method determines the dilution of any serum which will fix 2 minimal hemolytic units of complement in the presence of the specific antigen. The results are read following incubation at 37°C. for seventy-five minutes and an additional thirty minutes in the presence of sensitized sheep cells. Complete or partially complete fixation at a dilution of more than 1:3 is considered to be indicative of lymphopathia venereum.

The intracutaneous lygranum test is considered positive when the resultant nodule measures at least 6 mm. in forty-eight hours. The nonspecific reactions measure between 2 and 5 mm. and in the sensitized individuals the papule occurs both in the lygranum and yolk control antigen. Hypersensitivity to yolk was found in less than 1 per cent of the individuals tested. In 71 known cases of lymphogranuloma venereum the lygranum test was positive in 98.6 per cent and doubtful in 1.4 per cent. The same

series with mouse-brain antigen showed only 79.1 per cent positive, 7.5 per cent doubtful, and 13.4 per cent negative. The doubtful reactors with lygranum were negative with the mouse-brain antigen. Lygranum in a series of 144 tests demonstrated an incidence of 91.7 per cent nonspecific papules as compared to 75 per cent with mouse-brain control antigen. The additional sensitivity of lygranum may be due to its greater concentration of the antigen. The authors found the following concentrations of the antigen per cubic centimeter in the following preparations: mouse brain 10^3 minimal infective doses (M.I.D.), mouse lung from 10^7 to 10^8 M.I.D., and in the yolk sac antigen from 10^8 to 10^9.

The complement-fixation test in 48 known lymphogranulomatous cases proved positive in each instance and failed to cause fixation with control preparations from the respective normal tissues. Many cases were also tested prior to Frei tests to exclude the possibility of positive tests due to sensitization with the antigen. Squibb Institute studies further supported the contention that in the normal individual the Frei antigen does not incite the production of complement-fixing antibodies.

In another series of 30 individuals without a history of venereal disease, 28 were found serologically negative. One of the 2 remaining sera was that of a patient with ulcerative colitis, which in the opinion of some investigators may be due to lymphogranuloma, and the other was that of a small girl whose previous history was unknown. In other words, these 2 cases should not cause doubt as to the specificity of the test. Because of the sensitivity of the test and its simplicity of application the authors suggest its use for epidemiological surveys of lymphogranuloma venereum. ROBERT LICH, JR.

SURGERY OF THE BONES, JOINTS, MUSCLES, TENDONS

CONDITIONS OF THE BONES, JOINTS, MUSCLES, TENDONS, ETC.

Scheman, L., Janota, M., and Lewin, P.: The Production of Experimental Osteomyelitis. *J. Am. M. Ass.*, 1941, 117: 1525.

We present herewith a preliminary report on our experimental production of a lesion simulating human osteomyelitis. We were able to keep the animals alive for an indefinite period. For years attempts have been made to reproduce in animals lesions of bones resembling human osteomyelitis.

Young rabbits weighing from 2 to 2¼ lb. were used as the experimental animals. By injecting between 0.3 and 0.4 cc. of 5 per cent sodium morrhuate directly into the metaphysis of the tibia with a 23 gauge needle we hoped to produce sufficient vascular impairment in the bone to permit the growth of bacteria and the production of a lesion in bone. The animals were divided into the following groups:

A. Controls which received from 0.3 to 0.4 cc. of sodium morrhuate alone into the tibial metaphysis.

B. Controls to determine whether the culture used in Groups C, D, and E would produce an osteomyelitis following injection into the bone or intravenously without preparation of the bone field.

C. Animals which received between 0.3 and 0.4 cc. of sodium morrhuate in the tibial metaphysis and one hour later 0.2 cc. of a 1:50 dilution of an eighteen to twenty-four-hour broth culture of staphylococcus aureus into the same metaphysis.

D. Animals which received from 0.3 to 0.4 cc. of sodium morrhuate directly in one tibial metaphysis and 0.2 cc. of a 1:100 dilution of an eighteen to twenty-four-hour broth culture of staphylococcus aureus intravenously.

E. A group of animals which received an initial subcutaneous injection and one week later an injection of 0.3 cc. of sodium morrhuate in one tibial metaphysis, followed in one hour by an injection of 0.2 cc. of 1:50 dilution of a twenty-four-hour broth culture of staphylococcus aureus in the same metaphysis.

The broth culture was one which was originally obtained from a patient with hematogenous osteomyelitis and subsequently was passed through many rabbits.

The animals were observed from day to day for palpable swelling and were roentgenographed at weekly intervals. Involved bones were saved for microscopic section when the animals died or were killed. Heart-blood cultures were made on death, and also cultures from the involved bone.

From the invariable occurrence of osteomyelitis in Group E it can be seen that, subsequent to the preparation of the bone field with sodium morrhuate, bacteria which are implanted directly or

Fig. 1.

reach this field by the hematogenous route are enabled to grow and produce extensive destruction of bone, which on roentgenograms and microscopic sections resembles closely the disease as encountered in the human being.

Jones, R. R., Jr., and Martin, D. S.: Blastomycosis of Bone. *Surgery*, 1941, 10: 931.

In reviewing the literature on generalized blastomycosis the authors collected 63 cases which showed evidence of bone involvement. Six of the patients recovered after treatment, 3 were not followed up sufficiently long to determine the end-result, and 53 died of the disease. The detailed case report accompanying this article records the history of a seventh patient with bone blastomycosis who was cured after prolonged treatment. Because of the usually poor therapeutic results, the authors believe it of interest to summarize their information regarding this type of infection and to outline certain studies which they have found valuable in the diagnosis, prognosis, and treatment of the disease.

To establish an unequivocal diagnosis, the clinical impression must be supplemented by laboratory studies. The isolation and identification of blastomyces dermatitis from infected secretions or exudates is proof of infection and should be attempted in all cases. Tissue examination and cultures are time-consuming, and aspiration, drainage, curettage, and biopsy often are best deferred until the patient's allergic state has been determined by skin tests with a vaccine made from heat-killed blastomyces. The characteristic positive reaction begins after from twelve to twenty-four hours and reaches a maximum

in from two to four days, resembling closely a positive tuberculin reaction. In very allergic patients a sterile abscess may form at the site of inoculation. The occurrence of a positive reaction may be taken as presumptive evidence of the presence of a blastomycotic infection and this diagnosis is strengthened further by finding complement-fixing antibodies in the serum of the patient.

The test for sensitivity to heat-killed blastomyces vaccine and the complement-fixation test can and should be carried out as initial studies on patients suspected of having blastomycosis. From a diagnostic viewpoint the demonstration of blastomyces-dermatitis organisms in secretions or exudates should not be considered unequivocal proof of blastomycosis. Benham has emphasized the fact that other fungi causing generalized lesions may appear as rounded bodies in tissue fluids.

In addition to these studies, it is important to obtain roentgenograms of the chest in all cases of suspected infection because the lungs are the most common portal of entry of the fungus. Roentgenograms also may be made of any bone thought to be involved by the infection and particular attention should be paid to the possibility of spine lesions in patients who complain of backache. Plates should be taken at intervals from four to six weeks to follow the progress of the bone lesions. In the case of a solitary bone lesion, it may be difficult for the roentgenologist to differentiate between tuberculous osteomyelitis, a primary osteoclastic tumor (such as Ewing's sarcoma and myeloma), and gumma of bone. However, when there are multiple bone lesions, a roentgenological diagnosis of blastomycosis can be suspected. Well localized, sharply defined destructive processes in the metaphyses, when multiple, suggest blastomycosis rather than the other conditions listed above. It has been stated that roentgenological differentiation between blastomycosis and coccidioidal granuloma is difficult if not impossible.

As in any chronic debilitating illness, general hygienic measures are of first importance in the treatment of patients having generalized blastomycosis. Patients having this disease usually are individuals whose economic status is poor and who have been on an inadequate diet for months or years. Bed rest and an adequate diet are essential. The diet should be supplemented by the administration of cod liver oil, large quantities of orange or tomato juice, and brewers' yeast. Anemia, if present, should be treated appropriately. The administration of potassium iodide is best deferred and the care of the local lesions should be purely palliative and conservative until the diagnosis has been established and the patient's allergic status determined.

The skin test with blastomyces vaccine serves not only as a diagnostic procedure but also as a means of determining whether or not the patient should be desensitized. If the vaccine produces a sterile abscess, desensitization should be started with a dose of 0.1 cc. of a 1:1000 dilution of the vaccine (a 1:1,000,000 dilution of the original material). This is administered no more frequently than every other day and the dosage is kept below the point of causing a local or general reaction. Less sensitive patients can be started with a higher initial dosage. After the degree of allergy has been reduced, as judged by skin testing, iodides may be administered cautiously. A saturated solution of potassium iodide is usually given beginning with 3 drops t. i. d. and increasing 1 drop per dose every day until tolerance is reached. In the case of an exacerbation of symptoms following the taking of iodides, the drug should be discontinued promptly and further attempts made to desensitize the patient. Complete desensitization is not necessary; however, the blastomyces vaccine should be given until iodides are tolerated without unfavorable reaction. Beyond this the patient's need for the repeated administration of vaccine may be prescribed according to the judgment of the physician.

The care of the local lesions is best limited to conservative measures until desensitization is well under way and the administration of iodides has been started.

Potassium iodide was given to all 6 patients who recovered from bone blastomycosis. Three of these also received heliotherapy, which was believed to be beneficial. Two patients were given blastomyces vaccine with apparent benefit, and in 1 case roentgen therapy was thought to have been responsible for the improvement. There is a recent report of a patient who recovered after treatment with potassium iodide, antimony, and potassium tartrate given intravenously, and 3 cc. of colloidal copper given intramuscularly every five days for 20 doses. The last drug was believed to have caused the patient's improvement. The local application of a copper-sulfate solution would appear to be of little value in cases of the generalized disease. Although studies have suggested the possible value of the intravenous administration of gentian violet in this infection, no reported instance of its clinical trial was found.

The prognosis of the majority of patients having blastomycosis with bone lesions is poor, especially of those persons who have a high titer of complement-fixing antibodies. ROBERT P. MONTGOMERY, M.D.

Heberling, J. A.: A Review of 201 Cases of Suppurative Arthritis. *J. Bone & Joint Surg.*, 1941, 23: 917.

This article deals with the method of treatment used, the results obtained, and the details of the treatment of 201 patients with acute suppurative arthritis and seen at the orthopedic department of the Allegheny General Hospital, Pittsburgh.

The presence of suppuration was demonstrated either by aspiration or culture, or the diagnosis was reasonably sure from other clinical and laboratory findings before incision was made. Joints which were believed to be the seat of serous or serofibrinous infection were treated by more conservative methods and are not included in this series. In this series were 24 patients with complicating osteomyelitis of the adjacent bones of such severity that drainage or sequestrectomy was necessary.

The surgical procedure carried out involved briefly the incision of the joint under general anesthesia and the suturing of the appropriate sized, soft rubber drain to the capsule. This drain was never allowed to intrude into the joint. Active motion was started as soon as possible after the effect of anesthesia was over and was repeated every three hours. This demanded intensive co-operation between the young patients and the surgeon.

Thirteen deaths were directly attributable to the joint infection. Eight of the blood cultures showed the staphylococcus aureus, and 3 the hemolytic streptococcus; 2 were negative. Six deaths occurred in cases of patients with nephritic, diabetic, and cardiac complications. These conditions were known to have been present before the joints were affected.

In the author's experience the Willems method of treatment of acute suppurative arthritis gives entirely satisfactory results with joint motion when it is instituted at, or very soon after, the onset of the condition. Results become progressively less satisfactory in proportion to the length of time after the onset at which the treatment is started. This is believed to be the result of several factors:

1. When sufficient time has elapsed for adhesions to develop, the pockets thus formed cannot be drained properly by the active movements. Indeed, it is possible that this may even be harmful in promoting absorption from such pockets.

2. In cases of long duration, blood-stream infection is an ever-present danger, as well as an aggravation of existing organic disease from the infectious process.

3. In cases of long standing, erosion of cartilage with denuded bone areas hinders or prevents efficient active movements.

In this series there were more unsuccessful results in patients with hip-joint involvement, particularly in younger children, than in any of the others. It is believed that this was due to:

1. Late institution of treatment, after the purulent material had ruptured through the capsule and the head had been floated outward and upward.

2. The difficulty of early diagnosis.

3. Failure to maintain the limb in abduction and extension following the incision for a sufficient length of time.

4. Poor co-operation between the patient and the attendant when active motion was begun following the operation. This phase of the treatment must not be delegated to those unfamiliar with the technique.

5. Insufficient drainage or too early removal or extrusion of the drain.

ROBERT T. MCELVENNY, M.D.

Hipps, H. E.: The Clinical Significance of Certain Microscopic Changes in Muscles Occurring in Anterior Poliomyelitis. *J. Bone & Joint Surg.*, 1942, 24: 68.

The pathological changes which occur in the muscles in anterior poliomyelitis have received very little study. The gross changes have been entirely neglected until recently, and the work that formerly had been done on the microscopic changes was largely of a descriptive nature.

It is only natural that muscle function and muscle pathology should be closely interrelated. This was found true in the investigation of the gross pathological changes, and likewise should be true in the microscopic study. Since this study was made on living muscles in living patients and the actual strength and condition of the muscles was known, it was possible to correlate certain microscopic findings with certain types of muscle behavior.

This study was made on patients who had had the disease for two years or more. The muscles were carefully studied, graded, and often given physical therapy for varying periods of time before operation. Some standard operation that the patient needed was done. The incision, however, was lengthened so that in nearly every case the full muscle was visualized. Sections for microscopic study were removed from the most severely damaged part of each muscle.

Studies on muscle physiology have shown that from each anterior horn cell in the spinal cord there emerges an axon which goes through the anterior nerve root and down through the nerve to the muscle. Here, just before and after entering the muscle, it breaks up into many collaterals which, in the mammalian limb, supply from 100 to 160 fibers. The motor neuron with the regiment of muscle cells it supplies is called a "motor unit." It is easy, therefore, to see that the destruction of a single anterior horn cell will put a small group of muscle cells out of use. If one anterior horn cell were destroyed and its immediately adjacent anterior horn cell were not involved, then one would expect to find in the muscle a patch of relatively normal cells. Such is the picture presented in many muscles affected by anterior poliomyelitis.

The microscopic sections of functioning muscle affected by poliomyelitis show an increased interfascicular fibrosis; this is present only around those bundles which have been damaged and does not fill the interspaces between normal-appearing bundles. There is atrophy and disintegration occurring in many cells; only a cellular debris remains in some places. The most interesting findings, however, are the large round cells. They are present only in those bundles which also contain the atrophic and disappearing cells; they do not occur in normal bundles. These are normal viable cells and it is most likely that they are cells which have become hypertrophied. They are apparently trying to compensate for the weakness in that bundle due to the loss of other cells. It probably represents a compensatory hypertrophy.

The stretched muscle that occurs in the treatment of poliomyelitis gives a different picture from that just described. In this muscle there are many microscopic tears that are due to stretching. These tears show fibrosis but not of the interfascicular type. The fibrosis cuts directly across the muscle cells. These transverse zones of scar tissue weaken a muscle and

delay the flowing wave of contraction through the muscle, and the original tear not only damages the muscle cells directly torn but also the axon collaterals to other cells beyond the damaged zone. This shows that secondarily induced pathological changes may occur in muscle after the acute paralysis and re-emphasizes the clinical importance of preventing a stretch of the involved muscles.

The muscles that were atrophied and had not been exercised for long periods showed fatty replacement along with other changes.

The final weakness or strength of an involved muscle, then, is the summation of the pathological processes.

The age of the patient seems to have no bearing on the microscopic picture of any muscle. The muscles showing fatty replacement changes are uniformly weaker muscles than those showing fibrous replacement changes. No newly formed or regenerating muscle cells were found in any section.

Pathological changes occurring in muscle following acute anterior poliomyelitis occur in two ways:

1. Primarily, through denervation (the anterior-horn cell)
2. Secondarily, from abnormal variations of tension in the muscle

The cellular changes from denervation begin with atrophy and progress to degeneration, disintegration, and replacement changes. Too much stretching results in minute tears, zonal degeneration, and subsequent fibrosis, while too little tension produces changes identical with denervation and the rate of change is nearly as fast. These secondary changes may produce just as much weakness in a muscle as the primary denervation changes. Secondary changes following immobility and disuse seem to be more severe than those following overactivity.

Obviously, there is nothing that can be done for muscle cells which have lost their motor neurons and have undergone or are undergoing these regressive changes. Something might be done, however, about the secondary changes which occur.

ROBERT T. MCELVENNY, M.D.

Pique, J. A.: Stenosing Tenosynovitis—De Quervain's Disease (Enfermedad de De Quervain o tenosinovitis estenosante). *Semana méd.*, 1941, 48: 975.

De Quervain's disease or stenosing tenosynovitis is characterized by hypertrophy of the dorsal annular ligament of the wrist with resulting strangulation of the tendons of the abductor longus and the extensor brevis muscles of the thumb, with a consequent characteristic symptomatology. In 1895 Juan Federico De Quervain described this condition for the first time, in his report of 5 cases. Nevertheless, the condition has remained little known among physicians; only within the past ten years have there been any further reports on this subject. The author briefly reviews the literature to 1940; he mentions the contributions of Welti, Hoffmann, Marion, Poulsen, Nusbaum, Vischer, Hauck, Souer, and Francon (1940).

He then discusses in detail the anatomy of the anatomical "snuff-box" and the contiguous tendons. Macroscopically, stenosing tenosynovitis is characterized by hypertrophy of the dorsal annular ligament of the wrist at the level of the styloid process of the radius. There may also be deformities and adhesions of the tendons. According to Soeur the histopathology is characterized by two processes, (1) a proliferative reaction, and (2) a destructive reaction with hyaline and pseudocartilaginous degeneration. In the peritendinous spaces are seen numerous erythrocytes as well as fibrinous coagulum.

The author then discusses the etiology in detail. The incidence is greatest between the ages of forty and sixty years. In most instances the right side is involved. Trauma often initiates the condition; this may be one severe injury, or minor traumas in the form of repeated small injuries. The latter type occurs in certain workers, such as typists, tailors, and operators of manual machines. There is no evidence that certain infections such as syphilis, tuberculosis, or gonorrhea have any etiological significance in this condition. It occurs more frequently in females.

Various theories are submitted as to the pathogenesis of this condition. Thus Poulsen and Michaelis believe it is due to a periostitis after immoderate traction on the dorsal aponeurosis occasioned by certain movements. Finkelstein was able to produce the condition experimentally by mechanical or thermal trauma to the tendons through the intact skin. The chief symptoms are pain and loss of function. The pain begins gradually and is progressive with paresthesias at the level of the styloid process of the radius. The condition is chronic and progressive until finally the patient is afraid to use the involved hand because of the pain. The pain finally assumes a neuralgic character which is not relieved by rest, physical therapy, or analgesic medications. Sometimes it radiates to the forearm and even to the shoulder. Objectively there is maximum extension of the involved tendons of the thumb and exquisite tenderness on palpation of the styloid process of the radius. In most cases the roentgenogram is negative; occasionally there is noted a periostitis of the styloid process of the radius. The differential diagnosis must consider crepitating synovitis, osteitis tuberculosa, periostitis syphilitica or traumatica, neuritis, gout, and tuberculous synovitis.

Conservative treatment such as immobilization in splints and plaster is not very satisfactory. The treatment of choice is surgical intervention. This may involve either longitudinal incision of the aponeurosis over the tendons or extirpation of the external part of this sheath, or, more radically, total exeresis of the aponeurotic sheath. The author prefers the second method. The author presents two brief clinical reports of stenosing tenosynovitis treated surgically with clinical recovery and return to work in two or three weeks.

JACOB E. KLEIN, M.D.

De Araujo, A.: The Supranavicular Bone (Sobre o osso supra-navicular). *Rev. brasil. de ortop. e traumatol.*, 1941, 3: 1.

Treatises on the supernumerary bones of the foot rarely mention the supranavicular bone and when they do it is generally only to call attention to its rarity. In some recent articles it has been given different names, such as the dorsal astragaloscaphoid ossicle and the dorsal talonavicular ossicle.

Its clinical and medicolegal importance lies in the fact that it may readily be mistaken for fracture of the scaphoid or head of the astragalus. It is a small round or oval bone about the size of a grape-seed in the upper part of the dorsal opening of the joint interline between the astragalus and the scaphoid. It usually articulates with the scaphoid or may be united to it by a true synostosis.

It may be due to a supernumerary center of ossification or to a disturbance of the process of ossification brought about by hereditary, endocrine, or constitutional factors.

It is generally discovered on roentgen examination made for post-traumatic pain. A profile roentgenogram of the foot shows what might be taken for a fracture line, but it is smoother and less jagged. Even if a first examination does not permit of definite differentiation a series of examinations will show healing if it is a case of fracture, but no change if it is a supranavicular bone. This anomaly is frequently associated with the presence of other supernumerary tarsal bones.

In the roentgen examination of 680 feet the author found 6 cases of supranavicular bone, 4 in females and 2 in males. In 2 of the females the condition was bilateral.

As a rule treatment by physical therapy, massage, and immobilization is sufficient to give relief from symptoms, as it was in the author's cases. Surgical removal of the bone has been required in some cases by persistence of the pain or by acute inflammation.

AUDREY G. MORGAN, M.D.

Cooper, W.: Calcareous Tendinitis in the Metacarpophalangeal Region. *J. Bone & Joint Surg.*, 1942, 24: 114.

Growing experience with the general condition of calcareous bursitis and a review of the reported material seem to indicate that it is a disease entity with pathology and symptoms common to all involved areas.

Pathologically, the condition is secondary to degenerative changes in the tendons, ligaments, or capsule. Calcium is deposited as phosphate or carbonate, or in molecular combination.

There is an acute phase, with symptoms of inflammation, local redness, heat, pain, swelling, and tenderness. Associated with this may be restricted joint mobility, an elevated sedimentation rate, and fever. The roentgen picture is pathognomonic.

Other cases are classed as chronic and latent. Acute symptoms are associated with an abrupt onset.

The author presents 8 cases of calcareous tendinitis in the metacarpophalangeal region. In all but 1 the onset was acute during the day. In no case was there history of trauma or recent illness. Pain, swelling, and tenderness developed rapidly within minutes to a few hours. Roentgenograms showed in each case that calcific deposits corresponded to the area of greatest tenderness. Blood uric-acid studies were usually normal. Otherwise the resemblance to gout was striking. Treatment was given by means of plaster casts and diathermy. Subsequent roentgenograms showed rapid diminution to disappearance of the deposits within one month.

LEO MARKIN, M.D.

Haboush, E. J.: An Anatomical Explanation of Traumatic Low Back Pain. *J. Bone & Joint Surg.*, 1942, 24: 123.

There is a progressive increase in the width of the vertebral bodies from the second cervical to the fifth lumbar. This provides for the progressive increase in superincumbent weight. However, there is no increase of the leverage action of the posterior neural arches as the transverse processes of the lumbar vertebrae are situated in front of the articular processes rather than behind them, as in the thoracic vertebrae. The leverage of the transverse processes of the lumbar vertebrae is, therefore, less.

An anatomical description is set forth by the author demonstrating that the lumbar spine compensates for this weakness by its structural and ligamentous reinforcements except between the fourth and fifth vertebrae, which is the weak point of the spine. Cadaver specimens of the lumbar spine and pelvis with ligaments intact were subjected to flexion strains by a simple mechanical device.

The author reaches the conclusion that the first structures to rupture on forced flexion are the intertransverse ligament and the quadratus lumborum fascia between the fourth and fifth lumbar vertebrae. Next, the anterior and posterior longitudinal ligaments tear, then the articular capsule, ligamentum flavum, interspinal ligament, and, finally, the supraspinal ligament.

Low back pain with sciatic radiation following a flexion strain may be due either to a unilateral rupture of the intertransverse ligament and the quadratus lumborum fascia at the level of the fourth intervertebral space, or to a rupture of the quadratus lumborium fascia and a fracture of the transverse process of the fifth lumbar vertebra.

LEO MARKIN, M.D.

Burrows, H. J.: Coxa Plana, with Special Reference to Its Pathology and Kinship. *Brit. J. Surg.*, 1941, 29: 23.

Coxa plana (coxa plana essentialis) proves histologically to be a condition of necrosis of bone followed by repair. The necrosis differs from ordinary aseptic necrosis in showing lysis of trabeculae.

The results of animal experiments suggest that the lysis is not due to arterial anemia occurring in the

special anatomical circumstances of the presence of bone in an envelope of cartilage. A possible cause is some form of vascular disturbance other than arterial anemia—either venous obstruction or hematoma; the anatomical circumstances are such that either of these events might have profound results.

It would seem that the essential pathological changes in coxa plana and in the kindred conditions of the metatarsal bones and semilunar bone are the following:

1. Necrosis of a special kind with lysis of trabeculae.

2. Invasion by young connective tissue, resulting in (a) phagocytosis and (b) regeneration.

The chief destruction tends to be subchondrally situated, and the term "subchondral necrosis" is probably the best yet devised for the change. "Subchondral lysis" would perhaps be better.

A consideration of some of the radiological changes in the light of the known pathological changes includes:

1. The increase in the joint interval above the epiphyseal nucleus. The increase may be ascribed to thickening of the femoral articular cartilage.

2. Flattening of the epiphyseal nucleus. The early deformity probably depends upon the destruction within the nucleus.

3. Rarefaction in the epiphyseal nucleus. The early foci of rarefaction presumably result from the destruction of trabeculae and their replacement by necrotic debris, which will be transradiant pending its calcification. Later, the ingrowth of young phagocytic and reparative tissue must be a factor, especially as the products are at first largely osteoid tissue and cartilage, both, like the parent tissue, being transradiant.

4. Increased density in the epiphyseal nucleus. Granted that the increased density is not merely relative, several factors probably play a part. Among them must be reckoned the calcification of debris, for which there is pathological evidence.

The essential roentgenological criterion of osteochondritis: If it be accepted that lysis of trabeculae is characteristic of osteochondritis of the hip, then conditions elsewhere should not be accepted as akin to it unless they show, at the least, roentgenological evidence of obliteration of trabeculae at some stage. Were this criterion applied, many alleged examples of osteochondritis in various situations would be discounted.

The relationship of coxa plana: The term osteochondritis juvenilis, having been applied originally to coxa plana, should be used for conditions elsewhere in the body only if there is reasonable good evidence of their relationship to coxa plana. Superficial resemblances, usually clinical and roentgenological, have sufficed for the use of the term for many epiphyseal dystrophies and other conditions. Accordingly, we have formulated certain minimal pathological and dependent roentgenological criteria which should be satisfied before a relationship to coxa plana is presumed. Similarity of histological appearances does not prove etiological identity, but is valuable contributory evidence of pathological relationship. A study of the alleged examples of osteochondritis in various parts of the body with special reference to the criteria enunciated has caused the writer to make the following conclusions and classification:

1. Relationship to coxa plana: conditions giving both radiological and histological evidence of lysis-osteochondritis of the tarsal scaphoid bone (Koehler's disease), of a metatarsal head (Freiberg's disease), and of the semilunar bone (Kienbock's disease).

2. Probable relationship to coxa plana: conditions giving only roentgenological evidence of lysis, histological evidence being unavailable—osteochondritis of the primary center of a vertebral body (Legg-Calve's disease) and osteochondritis juvenilis of the capitellum (Panner's disease, to be distinguished from the more frequent condition of osteochondritis dissecans).

3. No relationship to coxa plana: no satisfactory evidence, neither roentgenological nor histological, of lysis—other alleged examples of osteochondritis juvenilis, including "generalized osteochondritis."

A comparison and contrast of the pathological and roentgenological changes in osteochondritis juvenilis with the known changes of ordinary aseptic necrosis reveals that the predominant roentgenological change in ordinary aseptic necrosis is an increase in density, whether relative or real, of the trabeculae, the texture of which is perfectly preserved although it may become confused in the occasional case which is complicated by secondary collapse. Only later may the trabecular structure be lost in places, by reason of the advancing areas of rarefaction which mark the inroad of osteoclastic and reparative tissue. In osteochondritis, on the other hand, bony texture becomes blotted out at a comparatively early stage.

The most striking histological change in ordinary aseptic necrosis of bone is death of the marrow. Although the bone cells also die, the trabeculae are perfectly preserved until they can be systematically replaced by an ingrowth of young connective tissue, the process of "creeping substitution." In osteochondritis gross destruction of trabeculae occurs in addition to their mere death, and this destruction precedes the invasion by young phagocytic and reparative tissue.

Treatment in the active stage only will be discussed. No method designed to modify the pathological process itself and so hasten repair seems to have succeeded. The most that offers any prospect of success is maximum preservation of the contour of the femoral head, and on the success of this the functional prognosis chiefly depends. This is best in the young, youth being probably the most important prognostic factor. This is readily explained by the fact that the epiphyseal nucleus becomes partly pulped, so that the integrity of the head depends mainly upon its cartilaginous dome. The younger the patient, the thicker this is and the smaller its span; consequently it is strongest at a time when the

deforming forces of body-weight and muscle pull have not yet become substantial.

The nearest approach to the logical ideal of eliminating both these deforming forces is provided by traction continued without important intermission till healing has occurred, a matter often of years rather than of months.

The objections to prolonged traction do not obtain with the same procedure as a temporary measure to counter joint irritation and consequent muscle spasm, sometimes present at the outset.

The most generally suitable treatment is probably still the use of a weight-relieving caliper.

Operative treatment is not warranted during the active stage, unless the condition starts as late as the sixteenth year; in this uncommon event, the response to conservative treatment is often poor, so that it may be better to perform an operation, such as Whitman's, during the active stage rather than expend much time on other treatment.

ROBERT P. MONTGOMERY, M.D.

SURGERY OF THE BONES, JOINTS, MUSCLES, TENDONS, ETC.

Bosworth, D. M.: Femoroischial Transplantation. *J. Bone & Joint Surg.*, 1942, 24: 38.

It has been generally recognized that in tuberculosis of the hip joint in which the head and neck of the femur have been extensively destroyed, the standard methods for securing ankylosis are either impossible, or the results are too poor to warrant their use. At Sea View Hospital, Staten Island, New York, a number of such problems have always been present. In view of the close approximation of the adducted femoral shaft and the tuberosity of the ischium, it was believed that severance of the femoral shaft and transplantation of its sharpened end to the ischium would result in a high percentage of synostoses. The first femoroischial transplantation was performed in December, 1936. Since then 9 patients have been operated upon.

The ages of the patients ranged from twelve to fifty-two years, with an average of thirty years. The average duration of the disease was twenty years. The onset in all but 2 cases occurred in early childhood. Complete disability for bearing weight without crutches, brace, or other support had been present in each instance for most of the duration of the disease. Many operations had been carried out on these patients. In four instances sinuses had been continuously present throughout the course of the disease, in 1 patient for fifty years. The presence of sinuses necessitated the operation being performed in two stages in 3 instances. In 1 of the 3 treated in this way, spontaneous ankylosis with continuing sinuses occurred; in another there was failure of ankylosis with continuing sinuses; and in the last healing was secured and second stage femoroischial transplantation was performed without reopening of the sinuses. Though the patients appeared to be in good general condition, the prognosis, when rated on the basis described by Cleveland, was poor in 5 instances because of chest, visceral, or other involvement. There was fibrous ankylosis in all hips. In 2 of the patients the hip disease was very active, and in 7 it was of minimal activity or quiescent.

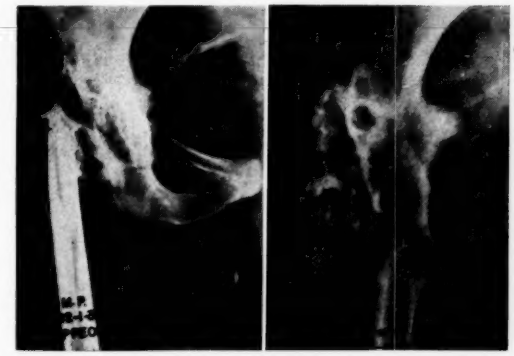

Fig. 1. Proved tuberculosis of the hip of fifty years' duration. Patient had been operated upon twenty-three times. a, left, Pre-operative roentgenogram. b, Solid weight-bearing union was secured by femoroischial transplantation in one stage.

Of the 9 patients operated upon, 2 died before ankylosis could be expected to occur. Of the 7 others, 5 have complete ankylosis, and 1 operated upon three months ago appears on roentgenograms to have satisfactory union. In 1 case the operation is definitely a failure. In this patient multiple sinuses preceded the operation and a single sinus still persists; ankylosis has not occurred. When ankylosis has occurred all clinical findings such as gait and sitting posture compare favorably with results from ankylosis of the hip by routine measures. Full weight-bearing was secured in from four months to one year.

When sinuses exist it may be necessary to do a so-called first-stage operation in an effort to get rid of the diseased trochanteric portion of the femur, remnants of the neck, fibrous tissue, and granulation

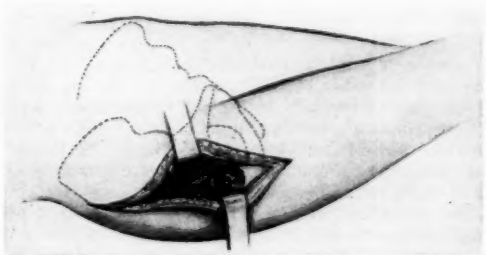

Fig. 2. The sharp end of the femoral shaft is buried in the ischial defect. The proximal fragment of the femur, which has been removed for illustrative purposes, may be left *in situ*.

tissue. The first operation consists of an oblique division of the femur above the level of the tuberosity of the ischium, the pointed portion of the distal fragment jutting up and inward, and the trochanteric mass, fibrous mass, and granulation tissue all being removed, down to the fibrous tissue covering the old involved acetabulum and lateral surface of the ilium.

The femoroischial transplantation can be done in one stage in all wounds without sinuses, and in other patients when healing has been secured following the first stage procedure. This is a difficult procedure for both the surgeon and the patient. The procedure is carried out through a lateral incision which extends from the trochanter well down on the femur through the fascia and vastus lateralis, with subperiosteal dissection of the femoral shaft opposite and just above the level of the tuberosity of the ischium. The shaft is then divided with an osteotome upward and inward in an oblique fashion, so that there is a point left on the distal fragment directed upward and inward. By blunt dissection the tuberosity of the ischium can be exposed on its distal and lateral surfaces, following retraction of the distal fragment of the femur. After denudation of a suitable place in the tuberosity of the ischium, a hole can be gouged out of the tuberosity with a large curette. All of these legs show gross shortening and some length can usually be gained if judgment is exercised as to the level of the femoral osteotomy. The tightness of the fit of the femoral end in the tuberosity of the ischium, caused by the tension produced following implantation when the bone is cut long, tends toward stability and coaptation of the fragments. By straightening the thigh to about 150 degrees and jamming the end of the femur well into the prepared defect in the ischium marked tension is put on the musculature and fascia. The wound is washed thoroughly with ether to remove fat and debris, and is closed in layers with silk. A double hip plaster spica is used for several weeks; the well leg is later removed from encasement, but the cast is not changed for at least three months. Roentgenographic evidence of union should be the guide for release from plaster retention and for weight-bearing. ROBERT T. MCELVENNY, M.D.

Friberg, S.: Total Extirpation of the Patella (Ueber Totalexstirpationen der Patella). *Acta chirurg. Scand.*, 1941, 85: 361.

The first total extirpation of the patella was done in 1871 for habitual dislocation of that bone. Until recently the indications for total extirpation have been primarily, early malignant tumors, early osteomyelitis, and tuberculous osteitis, involving the patella but not the knee-joint, and severe comminuted and compound fractures. The indication for complete operative removal of the severely fractured patella has not been generally accepted. During recent years reports of total patellar extirpation have become numerous and indications have been broadened, in some instances to routine removal for fracture. The procedure has also been employed in the treatment of osteoarthritis of the knee-joint.

In the operative repair following total extirpation one of two procedures is carried out: (1) suture of the quadriceps tendon to the patellar ligament; and (2) repair of only the parapatellar ligaments. In the latter circumstance extension after healing is effected through the parapatellar and prepatellar ligaments, which diminishes the power of extension and not uncommonly results in limitation of extension to some degree. As a rule one should try to suture the quadriceps tendon to the patellar ligament, but this may not be possible if contracture and fixation of the quadriceps exist.

The disease for which the author removed the patella was primarily chondromalacia of the patella. Conservative treatment of this condition is not always satisfactory. In Sweden chondrectomy of the diseased cartilage is the usual operative procedure employed in this condition, since it ordinarily gives a good functional result. If the disease is advanced, with wide degeneration of cartilage extending down to the bone, chondrectomy is no longer feasible. A patella-plastic operation might then be done by reducing the patella in thickness and covering its gliding surface with fascia lata or synovia. This is a more formidable procedure which causes extensive damage to the ligaments, and recovery at best is prolonged.

At the Karolinska Institute in Stockholm the author has performed patellar extirpation on 32 knees in 30 patients. All have been observed for at least one year after operation. There were 23 cases of chondromalacia patellae. The remaining patients had rigid knees, as a result of a fractured femur or patella in 5 and 3 cases respectively, and following suppurative arthritis in 1 case. There were 19 males and 13 females whose ages averaged thirty-four and forty-one years, respectively. In the chondromalacia group the duration of symptoms averaged twenty-two and one-half and fifty-two months for males and females, respectively. Physical therapy had been ineffective and most of the patients were partially or totally disabled.

A bloodless operation was performed, an Esmarch bandage and novocaine spinal anesthesia being used. The usual approach was through a longitudinal incision over the anterior aspect of the patella and through the prepatellar tendon. A transverse incision has certain advantages but serious disadvantages, the chief of which is the weakness of repair if the quadriceps tendon cannot be sutured to the patellar ligament. The patella can be shelled out most easily if the proper plane of cleavage is entered at its upper margin. It is important to avoid undue injury to the ligaments about the patella, especially on its anterior surface. The quadriceps tendon is grasped with traction clamps and drawn downward and sutured to the patellar ligament. This is difficult in cases of old injury in which there is rigidity and fixation in the region of the suprapatellar bursa. Covering the patellar defect with fascia lata or the line of suture with synovial membrane was found to cause tension and therefore these procedures have been

abandoned. It is important to close the line of suture near the margins of the patella accurately so that calcified deposits which might form will not be in contact with the joint. Plaster casts were applied immediately or a few days later. In about ten days active quadriceps exercises were started. The average hospital stay was five weeks.

One patient was able to resume her household work one month after operation. The average time for returning to work was two and seven-tenths months. Classification of the 32 cases according to the functional result obtained revealed that 13 were entirely free of symptoms and could engage in their usual work and in sports. Fourteen patients were able to do their usual work but complained of incapacity for strenuous activity. These two groups comprised 84 per cent of the series. The remaining patients had to engage in lighter activities and complained of impaired strength and intermittent hydrops. This group was made up entirely of post-traumatic cases. The knee-joint contour was restored in those who had a quadriceps-patellar-ligament suture. Some atrophy of the thigh muscles was present in all but 2 cases. Complete extension was obtained in all cases with tendon suture and in 4 of 6 without tendon suture. The power of extension was, on the other hand, generally impaired. In 15 cases there was slight limitation of flexion. The drawer symptom was positive in 20 cases. Roentgenograms revealed slight calcified deposits at the site of the patella in 26 cases.

On the basis of his experience with old fractures of the patella the author recommends extirpation for recent splintered and transverse patellar fractures. The limitations of the procedure in cases of chondromalacia are discussed. JOHN L. LINDQUIST, M.D.

Milch, H.: Fascial Reconstruction of the Tibial Collateral Ligament. *Surgery*, 1941, 10: 811.

Injury to one or both of the crucial ligaments does not necessarily mean poor knee function. It has, however, been established that permanent damage to a tibial collateral ligament is disabling. The anatomical attachments, direction of fibers, and function of the tibial collateral ligament are described here.

An operation for reconstruction of the tibial collateral ligament is suggested. A curved L-shaped incision about 6 in. long is made on the anteromedial aspect of the knee (Fig. 1.) The procedure is completely extra-articular, although access to the joint may be obtained if desired. The most important step in reconstruction of the tibial collateral ligament is placing the fascial graft directly over the course of the anterior portion of the tibial collateral ligament. The upper and lower attachments of the tibial collateral ligament are exposed and two 3/8 in. drill holes are made at each extremity of the ligament. The two upper drill holes are joined by a tunnel, as are the lower drill holes. A piece of fascia 10 in. long and 1/2 in. wide is cut subcutaneously from the fascia lata of the same thigh. The knee is held in slight flexion while the fascial graft is passed in and out through the drill holes, made taut, and sutured to the remnants of the tibial collateral ligament. The incision is closed with interrupted sutures and a plaster-of-Paris cast is applied with the leg held in adduction. The cast is left on for a period of from four to six weeks. Weight-bearing may be begun at the end of six weeks, at which time a knee brace is suggested.

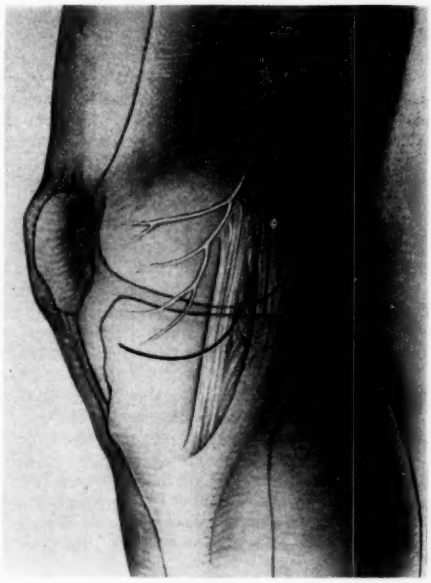

Fig. 1. Transparent drawing showing relation of skin incision to bones and underlying soft tissues.

Eight surgically treated cases are described, of which 7 had satisfactory results.

RICHARD J. BENNETT, JR., M.D.

FRACTURES AND DISLOCATIONS

Urist, M. R.: Calcification and Ossification. The Role of Local Transfer of Bone Salt in the Calcification of the Fracture Callus. *J. Bone & Joint Surg.*, 1942, 24: 47.

The author applies methods previously described by him for the study of the calcification process in experimental fractures. Rachitic animals were used because it is believed that they provide better material for analysis of the process of calcification in the fracture callus than does the normal animal.

This article attempts to answer the following questions:

1. Is there a transfer of bone salt from bone to fracture callus, and, if so, how important a part does it play as a stimulus to healing, and as a source of minerals required in the calcification of callus?

2. If such a transfer to the callus occurs, is the bone salt derived from the portion of the shaft which becomes necrotic as the result of injury, from the uninjured and living cortical bone, or from both?

3. If such a transfer occurs, what is the mechanism of removal of the bone salt from preformed bone, of its local transport, and of its deposition in the calcifiable tissues of the fracture callus?

4. If local transfer of bone salt plays a significant part in the healing of fractures, can this process be supplemented by the local introduction of the minerals needed in the calcification of the fracture callus.

As to the answers of Questions 1 and 2 the author states that while local transfer of bone salt occurs, it is chiefly from the living shaft, rather than from necrotic bone; that it occurs only after the portions of the shaft adjacent to the fracture have become enclosed in callus; and that the capacity of this mechanism is too limited to be the "effective source of calcification" of the callus. The same mechanism by which growing bone is calcified and by which the ordinary wear and tear of bone is compensated for, that is, the humoral transport of bone mineral, is of far greater importance in the healing of fractures in normal individuals under normal conditions of mineral intake.

In answer to Questions 3 and 4 the author states that because local implantations of devitalized bone or injections of colloidal calcium phosphate in the rachitic callus osteoid, prior to the advent of spontaneous calcification, fail to initiate calcification, it is concluded that these substances cannot be regarded as local sources of the bone salt. The differences between the mechanism of the resorption of living bone and that of the process of absorption of dead bone or calcium salts suggest that the local redistribution of the bone salts in the area of healing fracture is brought about by the activity of the cellular elements of the bone, possibly the osteoclasts.

This article is interesting and also provocative. The details of Urist's work are too numerous to bring out in an abstract of this length. The original should be read by anyone who is at all concerned with the problems of bone healing.

ROBERT T. MCELVENNY, M.D.

Usadel, G.: The Treatment of Dislocation of the Shoulder Tip with Cephalad Displacement of the Clavicle (Die Behandlung der Schultereckverrenkung mit Kopfwaertsverlagerung des Schluesselbeins. Luxatio claviculae supraacromialis). *Ergebn. d. Chir., u. Orthop.*, 1941, 33: 387.

Hippocrates was the first to describe the luxatio claviculæ supra-acromialis and he warned against confusing this with luxation of the humerus. He recommended a dressing the purpose of which was to force the protruding end of the clavicle downward and the arm upward. In this manner it becomes possible to get rid of the pain of the injury in the course of a few days. As far as the end-result is concerned, however, a protrusion of the bone always remains but otherwise the shoulder joint suffers no permanent damage. This historical review further leads to Galen, Paul von Aegena, Ambrose Pare, up to the present time. The unsatisfactory results following treatment by means of various dressings necessarily led to the institution of surgical treatment (Cooper, 1861; Koernig, 1874; Baum 1886). The cosmetic result improved whereas the functional result did not. Rene Sommer, as late as 1927, in an article based on 287 subluxations of the clavicle, still recommended operative treatment because he believed the latter alone was capable of producing both certain and ideal results. In the meantime a reaction to this theory set in. The disciples of conservative treatment increased in number. The annual average of luxations of the shoulder joint, however, also increased in number because of the motorization of traffic, and especially as the result of the increased use of motorcycles.

The complete luxation of the clavicle shows a separation of the displaced bones amounting to the width of the clavicle and more, the incomplete luxation usually shows deviation of less than 1 clavicular transverse diameter. The supra-acromial clavicular luxation must be differentiated from supraspinatous clavicular luxation, as well as acromial and subcoracoid clavicular luxations. The latter 3 forms are rare. Luxation of the shoulder tip occurs 4 times as frequently as that of the claviculosternal articulation.

The etiology is for the most part a sudden fall on the shoulder. The body, being propelled by the force of gravity during its fall from a height, or by the velocity of motion during a fall from a moving vehicle, is suddenly halted by an interposing obstruction coming in contact with the direct tip of the shoulder and, as a result of its remaining momentum, forces the clavicle cephalad because of the upward push of the ribs. The action of a weight falling from above on the acromion may also form an etiological factor.

One obtains a clear impression concerning the degree of luxation if one orders the patient (according to Usadel) to turn the shoulders as far forward as possible with the cervical spine in extension and the upper part of the arms turned inward. Roentgenograms of this position will give a clear picture of the degree of injury. Complete restoration of the articulation can be brought about following incomplete luxation, without any special treatment by means of suture. If a fresh luxation is not kept completely fixed following reduction until a firm union of the articular ligaments has occurred, a recurrent (habitual) luxation of the shoulder tip may result. If reduction is either not obtained or only incompletely obtained, a more or less raised clavicular hump will remain. The latter may eventually become gradually lower as the result of shrinking of the scar tissue. Aside from this, the replacement of the involved parts to their anatomical relationship will lead to a painless and normally functioning shoulder girdle. However, this injury may lead to some dis-

turbances of function resulting in pain and ankylosis. The calcification which usually occurs in the torn coracoclavicular ligament and the subclavius muscle in complete luxations of the shoulder tip runs a painless course in most instances.

As far as the therapy is concerned, one must differentiate between fresh and old luxations and between people who are younger than thirty-five years of age and those who are older, and, further, between closed and open reductions. Whether the therapy is open or closed reduction, when we are dealing with people beyond the age of thirty-five, the end-result depends upon the early (i.e. within eight days after the injury), institution of functional therapy. Adduction dressings are to be basically avoided. Of the many types of dressings which have been thoroughly described, the only ones which are still considered permissible are the Boehler clavicular splint-dressing bandage, and the modified Stella dorsi. Both of these enable active motion of the involved arm from the very first day of treatment without injury to the healing process. According to the opinion of Usadel, operative intervention is generally superfluous. He particularly rejects as harmful all those procedures which are recommended by means of nails, wires, or drills which pass through the clavicle in its longitudinal axis. Thus, there only remain those procedures which avoid the joint, such as the fascial plastic operation, according to Fuerst, and those which fix the clavicle to the coracoid process.

(Plenz). Harry A. Salzmann, M.D.

LaFerté, A. D., and Nutter, P. D.: The Treatment of Fractures of the Humerus by Means of a Hanging Plaster Case—"Hanging Cast." *Ann. Surg.*, 1941, 114: 919.

A report of the final results obtained in 119 consecutive cases treated by the hanging plaster cast is presented and a similar report of 58 additional cases reported in 1937. Little change has been made in the essential details of this method of treatment since it was first begun. Indications for and exceptions to its use have remained the same.

Some advantages of the hanging-plaster-cast treatment are that it allows the patient to become ambulatory in a minimum length of time, without having the annoyance of cumbersome appliances necessary for treatment with the arm in the abducted position. It is economical in that it reduces hospitalization time, dependent care, and the cost of materials used.

Seventy-two fractures of the upper third of the humeral shaft and neck were all successfully treated by the hanging plaster cast and 47 fractures of the middle and lower thirds of the humeral shaft were treated with satisfactory results.

In several cases of this series, displaced fractures became reduced shortly after application of the encasement. Others were reduced before this was applied. In fractures of the neck, medial angulation is satisfactorily reduced in some patients by means of a sponge rubber roll placed high in the axilla. Lateral angulation in fractures of the shaft is corrected by a wedge on the inner side of the encasement at the elbow. Anterior and posterior angulation is corrected by shortening or lengthening the sling.

The average length of time of treatment in the encasement, for all patients in this series, was approximately six weeks; however, those fractures in the middle and distal thirds of the humerus with the fragments in poor opposition and alignment required a slightly longer period of encasement, the average length of time being about seven weeks.

The authors use the hanging cast in conjunction with adhesive and skeletal tractions, as a postoperative encasement and for delayed unions in which other forms of treatment are contraindicated by the general condition of the patient. Case reports exemplify many various phases in the treatment of fractured humeri, in which the hanging cast can be used advantageously.

Shoulder motions require the attention of the patient and the physician. There may be limitation of motions in various degrees in the shoulder joint in a small percentage of cases, but the limitations are not sufficient in frequency or degree to be a contraindication to this form of treatment.

Fractures of the humerus considered unsuitable for treatment by the hanging plaster cast are those that involve the condyles or supracondylar area, badly comminuted fractures of the head with poor position of the fragments, those of the head and neck associated with dislocation at the shoulder joint, and fractures of the greater tuberosity with displacement. These are treated by other methods and none are included in this series.

The plaster bandage is applied with the patient either sitting or recumbent, as convenient, or as the condition of the patient permits, the elbow flexed to a right angle, with the forearm held in midpronation. An adequate length of stockinette is pulled over the arm, and a strip of saddlers' felt, 1 in. in width, is made to encircle the wrist just above the ulnar styloid. The plaster bandage is applied either with no other padding or with a few turns of flannel bandage.

A loop for a sling is made just above the wrist on the upper surface of the encasement by a few turns of the last plaster bandage applied. This loop can be applied either slightly medialward or lateralward to the midline of the upper surface of the encasement to help correct inward or outward angulation of the lower fragment.

The patient is instructed after application of the hanging plaster cast to allow the arm to swing freely at his side at all times. Many patients have an inclination to rest the elbow on the arm of a chair or some convenient object when sitting. This is contrary to the main purpose of the encasement which is traction by gravity. This difficulty is greatly lessened when the patient is made to realize the principle of this method of treatment, and that his chances for a good result depend wholly on his full co-operation.

Some patients find it more comfortable to sleep sitting in a chair for the first week or so; others use a back rest which permits the arm to swing as freely

Fig. 1.

Fig. 2.

Fig. 3.

Fig. 1. The hanging cast showing suspension loop.
Fig. 2. Showing the sponge rubber roll in position, in order to correct lateral angulation.
Fig. 3. Showing the felt roll in position, in order to correct medial displacement of the lower fragment.
(Courtesy of J. B. Lippincott Co.)

as when in the erect position. The remainder sleep satisfactorily with upper arm either resting on a pillow or with the whole arm placed across the chest.

Active motion of the wrist and hand has been encouraged from the beginning. The patient is instructed to lean forward and let the shoulder swing in circular motions several times a day. These passive movements are sufficient to preserve considerable free motion at the shoulder joint until active motion can be safely instituted. After a few days active motion is allowed in the anteroposterior plane. Whenever moderate callus formation can be demonstrated roentgenologically, active abduction is encouraged.

Roentgenograms are taken two or three days after application of the encasement to determine the position of the fragments, and if necessary, adjustments are then made. From then on until union is adequate to allow removal of the encasement, check-up roentgenograms are taken at two-week intervals.

ROBERT P. MONTGOMERY, M.D.

Ordóñez Ferreyra, H., and Martinez Carranza, H.: Bennet's Fracture (Fractura de Bennet). *Bol. y trab. Soc. de cirug. de Cordoba*, 1941, 2: 263.

The authors report 8 cases of fracture of the base of the first metacarpal bone. The typical Bennet's fracture has an oblique direction. The part of the palmar apophysis points downward and outward while the remaining portion of the bone is dislocated in a dorsal direction.

The following types of fracture of the base of the first metacarpal bone may be differentiated as follows:

1. Total extra-articular fracture; a. complete; (1) oblique; (2) transverse; b. incomplete or infraction.
2. Mixed extra-articular fractures with an intra-articular fragment; a. transverse; b. oblique.
3. Articular fractures of Bennet's type.
4. Articular fractures of Rolando's type (Y-shaped).
5. Partial articular fractures which are H-shaped and have four fragments, three of them intra-articular.

Unless treated, a fracture-dislocation represents a grave lesion which may be responsible for a partial disability of the hand amounting to from 15 to 20 per cent.

Four fundamental movements of the thumb may be distinguished: adduction, abduction, opposition, and reposition. The purpose of the reduction of the fracture is to avoid limitation of these movements. The authors found that the best results can be obtained when traction is exerted in the direction of a line from the center of the fold in the elbow to the styloid apophysis of the corresponding radius. In this manner an intermediate position of the thumb, equidistant from the mentioned four positions is obtained. Simple traction, as a rule, reduces the fracture well. Urrutia's arch or an adhesive compound called mastizol may be used for traction.

JOSEPH K. NARAT, M.D.

Lamare, J. P., and Larget, M.: External Osteosynthesis of the Femur by Bipolar Fixation of the Spatial Type (L'ostéosynthèse externe du fémur par fixation bipolaire à type spatial). *Mém. Acad. de chir.*, Par., 1940, 66: 656.

The method of external fixation of fractures of the diaphysis of the femur employed by Lamare and Larget has two special characteristics: (1) it immobilizes the two extremities of each fragment; and (2) the apparatus for holding the metal pins in place utilizes the three dimensions of space, i.e., it is of the spatial type. The pins are placed according to localization of the fracture and the condition of the bone, and the apparatus is arranged so as to make the fixation secure. The entire femur is immobilized, but the joints are left free.

This method is used only in those fractures of the femur in which orthopedic traction does not give a satisfactory reduction in ten days. Seven cases are

reported in which it has been used; in these cases there has been no shortening of the limb and the function of the knee and hip is good, except in 2, in which there was an associated fracture of the head of the femur. In the first 3 cases, there was a transverse comminuted fracture of the shaft of the femur, with a large intermediary fragment. In 1 of these cases this fragment was fixed by means of two Leveuf ligatures, but healing was not as satisfactory as in the other cases in which this was not done; in this case further immobilization in a plaster cast was necessary for good callus formation. In one of the other cases, this fragment was left free, in the other it was removed; in both a large strong callus formed and the end-result was good.

In the apparatus now employed, the bone pins are of non-oxidizable metal, and the fixation apparatus is of duralumin, which makes it of light weight, so that early active mobilization is possible.

ALICE M. MEYERS.

Fernandez, O. C.: Cinesitherapy in the Treatment of Fractures (La kinesiterapia en el tratamiento de las fracturas). *Semana méd.*, 1941, 48: 1042.

In former times fractures were rigidly immobilized with frequent failure of function until Teissier of Lyons in 1841 began to combat this method, stating that it had a harmful effect on the joint with resulting loss of function. Amadeo Bonnet in 1844 noted the following joint changes in fracture cases: (1) serosanguineous extravasation with fibrous transformation and resulting false intra-articular membranes; (2) the cartilages become dry and rough; and (3) the cartilages atrophy and form an ankylosis. This stimulated some surgeons to start massage and early movement.

Starke in 1877 was the first to use these methods. Later enthusiasts pointed out the benefits of this treatment in promoting good union and normal callus formation. At this time Lucas Championniere advocated early massage and movement. In 1906 the Belgian surgeon, De Marbaix, reported on the poor results obtained by two months' fixation and immobilization of multiple fractures of the lower third of the radius. In more modern times Boehler advised the necessary immobilization in a non-padded cast, but also encouraged active motion of the affected limb and the rest of the body. He emphasized that time and rest cure fractures. The author points out, however, the undoubted benefits to be derived from the various kinds of massage which he describes in great physiological detail. The author mentions Retterer's experiments on young horses in 1908, in which he demonstrated that functional excitation causes the elaboration of a hard, tough bone tissue. The same author noted that immobilization caused reflex bone atrophy. The neighboring soft tissues and joint play an important part in the recovery of the fractured bone. After massage and before mobilization, the author uses radiation therapy (1 cm. wave length at the frequency of 5 to 15 per second). This has a good effect on the trophic and vasomotor reactions. Penot notes that massage and early motion are more effective in restoring function than exact reduction and prolonged immobilization.

The author warns that there is no standard cinesitherapy, that each case must be treated according to its own merits. The responsibility of the surgeon is not over when the bone has healed; it continues till the patient is restored to useful life and function.

The author concludes that cinesitherapy is a logical and indispensable aid in the treatment of fractures if complete anatomical and functional restitution is desired. Prolonged immobilization without cinesitherapy delays the healing of fractures; the longer the immobilization, the more difficult is the functional recovery of the fractured member. By cinesitherapy the author means not only massage, but the six modalities, namely, massage, radiation therapy, passive motion, mechanotherapy, motor re-education, and medical gymnastics. The cinesitherapist is an important assistant to the surgeon in the treatment of fractures from the early period of immobilization to the treatment of sequelae and the restoration of the patient to his normal activities.

JACOB E. KLEIN, M.D.

ORTHOPEDICS IN GENERAL

McCarroll, H. R., and Crego, C. H., Jr.: An Evaluation of Physiotherapy in the Early Treatment of Anterior Poliomyelitis. *J. Bone & Joint Surg.*, 1941, 23: 851.

This article deals with a critical survey of the results obtained in the treatment of 160 cases of anterior poliomyelitis admitted to the Shriner's Hospital, St. Louis, during the years 1935, 1936, 1937, and 1938.

The cases were treated as follows:

1. Thirty extremities were given short periods of immobilization (from one to four months) without physical therapy.
2. Ten extremities were given short periods of immobilization (from one to three months) in solid plaster followed by physical therapy for from three to six months.
3. Seventy-five extremities were given prolonged plaster immobilization (from four to eighteen months) without physical therapy.
4. Nineteen extremities were given delayed plaster immobilization (from six to eighteen months) in an attempt to improve power.
5. No treatment was used in 129 of the extremities.

In this study no particular form of therapy produced results that were outstanding. In fact, the highest percentage of satisfactory (brace-free) extremities were obtained in that group of patients who received no treatment during the early stages, and who began to walk without support as soon as they could get out of bed. The degree of initial paralysis was of far greater value in determining the

degree of residual involvement than was the type of treatment used.

It seems safe to assume, therefore, that in the final analysis, the results in anterior poliomyelitis can be more adequately explained on the basis of the underlying pathological process than on the form of the early treatment which is used. Initial paralysis in many instances is on the basis of a block in the pyramidal tracts from localized edema or hemorrhage without destruction of the ganglion cells. Such a paralysis is temporary in character, and muscle function returns with relief of the pressure from the anterior horn cells with the subsidence of the edema.

Instances of only partial paralysis of an extremity in the beginning can easily be explained on this basis, and could account for their higher percentage of satisfactory results. Those extremities showing satisfactory functional return in spite of apparent initial complete paralysis can also be explained on this basis. If, instead of this temporary pressure paralysis, however, the anterior horn cells are actually destroyed, the muscles supplied by those nerve cells will remain completely paralyzed regardless of the type of treatment. In those cases with complete paralysis in one or more extremities at the onset, one can imagine a more destructive underlying pathological process. This actual destruction of nerve cells, rather than temporary pressure block of the pyramidal pathway, probably accounts for the lower percentage of satisfactory results in cases of this type.

The authors do not wish to imply that all orthopedic measures should be discarded in the treatment of acute stages of this disease. Careful immobilization should be used for three reasons:

1. For the comfort of the patient during the acute stage
2. To prevent the early development of deformities
3. To prevent stretch paralysis in a partially paralyzed muscle

It must be admitted that other treatment of any kind has little or no effect on the course of the disease.

ROBERT T. MCELVENNY, M.D.

SURGERY OF THE BLOOD AND LYMPH SYSTEMS

BLOOD VESSELS

Moore, S. W., and Knapp, G. M.: Varicose Veins.
Ann. Surg., 1942, 115: 131.

During recent years there has been an increased interest in the treatment of varicose veins. In reviewing the many articles, however, it was found that follow-up studies which would allow one to arrive at a comparison of the end-results were lacking. The authors presented an analysis of the results of operative procedures in 121 patients cared for in the varicose-vein clinic of a New York hospital during the six years from 1932 to 1938. They then discuss the various forms of treatment of varicose veins most commonly employed, among these being injection, simple ligation, simple high ligation, high ligation and injection, and high ligation and excision. After reviewing their series of cases they reach the following conclusions.

1. An accurate knowledge of the normal anatomy and of the pathological physiology of the veins of the leg is necessary for the intelligent treatment of varicose veins. Inquiry into special factors in the history of the disease in the individual case and physical tests of the circulation cannot be omitted without giving rise to some poor results.

2. The operation is best carried out with the patient hospitalized, and with sufficient assistance at the operating table to guarantee good exposure and careful attention to detail.

3. Extensive operations are contraindicated because they carry greater risk of pulmonary embolism by necessitating longer rest in bed than do the simple procedures in which the patient can get up immediately after operation.

4. The best results in this series of cases have been obtained with simple high ligation of the internal saphenous vein, with injection of sclerosing fluid at the time of operation.

5. Any modification of operative procedure answers the requirement so long as the ligation of the saphenous vein is carried out at the saphenofemoral junction and the tributaries in this region are divided. An operative procedure must be chosen, which most nearly corrects the faulty vascular system in the individual case.

6. If the perforators or valves of the saphenous vein are incompetent, operation followed by injections of sclerosing fluids offers the best chance of a permanent cure.

PAUL MERRELL, M.D.

Brunstein, I. A.: The Prevention of Discomfort and Disability in the Treatment of Varicose Veins.
Am. J. Surg., 1941, 54: 362.

Pain, discomfort, physical disability due to dermatitis, phlebitis and ulceration, and economic disability are some of the complications and sequelae of varicose veins which can be prevented or reduced to a minimum by proper care. Adequate injection of varices, vein ligations at the correct sites, and such local measures which will heal ulceration and prevent edema are the present accepted forms of therapy. Improvement at present can be made in the technical details of the accepted methods.

Extravasations resulting in perivenous edema, induration, and sloughing may be prevented by:

1. Avoidance of puncturing an indurated, pigmented, or eczematous area by starting the injection in healthy tissue.

2. Fixation of the vein to prevent its transfixion or its displacement by the needle. This is best done by exerting an upward pressure with the thumb on the overlying skin.

3. Introduction of the needle parallel to the longer axis of the varicosity and selecting from a cluster of varices the varix with the greatest diameter.

4. Avoidance of transfixion of small invisible subcutaneous varicosities when approaching a large varix with the needle; these can be revealed by careful palpation of the area.

5. Insertion of the needle at about ⅛ in. from the vessel to avoid puncture of the skin over the varix. This is imperative when injecting superficial, intracutaneous, bluish varices covered by only a thin layer of atrophic skin. Necrosis and sloughing will result from contact of an irritant solution with the weakened tissues surrounding the puncture.

6. Avoidance of dislodging the needle while pressure is exerted on the plunger. This is best effected by firm but gentle pressure of the fingers supporting the syringe on the extremity. This precaution will anchor the needle within the vessel lumen and prevent transmission of the force exerted on the plunger to the needle.

7. Avoidance of overdistending the varix with sclerosing solution. Increased resistance to the introduction of solution with visible bulging of the injected varix is a warning signal to discontinue the injection.

The use of needles of small gauge (No. 25 or 26, from ¾ to ⅝ in. long) will facilitate firm anchorage in the vessel lumen and prevent leakage of the sclerosing solution into the surrounding tissues.

The author uses 5 per cent sodium morrhuate and injects into the emptied vein. Injection into an empty vein allows smaller amounts of solution to occlude a larger segment of vein with the prospect of permanent occlusion. Full vein injection because of dilution of the sclerosing agent requires a larger amount of solution and the resulting thrombosis may be unsightly, painful, and permit recanalizations.

Adequate compression over a broad surface is also necessary to maintain the collapsed state of the vessels, prevent swelling, avoid extension of massive thrombosis, and obviate the spread of phlebitis.

MANUEL E. LICHTENSTEIN, M.D.

Payne, R. T.: The Scope of Operation in the Treatment of Varicose Veins. *Brit. M. J.*, 1941, 2: 533.

This article is concerned particularly with the operative treatment of primary varicosities in the uncomplicated stage. Uncomplicated cases include all those up to the congestive stage but exclude those beyond this: namely, dermatitis, ulceration, and phlebitis. Surgical treatment may, of course, be required for some of these complicated cases, and although many of the principles which are described are also applicable, with modifications, to the advanced group of cases, the complicated cases are not considered here in detail. The term "primary varicosity" excludes all cases in which the varicosity develops secondarily to an obstruction of the deeper vessels, e.g., femoral thrombosis.

Varicose veins may be treated by injection in most cases, by operation alone in a few, and in some by operation and subsequent injection. The proportion of cases requiring either operation or operation and injection will, of course, be determined by the severity and nature of the condition.

The anatomical aim of all forms of radical treatment, whether by injection or by operation, is to bring about obliteration of the varicose vessels either by thrombosis and organization or by actual removal. The physiological counterpart of this is the functional obliteration of the varicose circulation with its stagnation and congestive phenomena and the tendency toward a to-and-fro movement of the blood. The clinical counterpart is the relief of symptoms, the removal of mechanical factors favoring the progress of the disease, and the elimination of the risks of possible complications.

The absolute indications for operation are:

1. The anatomical extent of the involvement. Involvement of the main internal saphenous vein above the level of the knee-joint is usually an indication for operative treatment, and the nearer the pathological change approaches the saphenous opening the stronger will be the indications for operation. This assumes the presence of valvular incompetence of the affected vein, with reflux of blood on coughing.
2. Presence of saphenous or other varices.
3. Ectasia, by which is meant dilatation and increase in size of a vein associated with valvular incompetence, but the vein remains relatively straight and its walls are very thick.
4. Size of the veins. Huge masses of tortuous veins are often best treated by excision, especially when they are the size of the index finger or thumb. Mere size is not necessarily a contraindication to injection treatment, but operative treatment has the advantages of being quicker and less painful and of giving a better cosmetic result.
5. Failure of response to injections.
6. Recanalization after injections.

The relative indications for operation are:

1. Rapidity of development. In cases in which varicose veins develop very rapidly, injection treatment is little more than symptomatic, and there is really a contest between the therapeutic thrombosis and the development of fresh varicosities. Operation in such cases may be the only practicable solution.
2. Family history. A family history revealing considerable varicosities obviously favors the more radical method.
3. Age. Relatively rapid development at an early age will favor operative treatment.
4. Occupation. The question of employment will rarely be the only indication for operation.
5. Geographical considerations. If a patient is going to a part of the world where he cannot obtain skilled attention, operative treatment may give better prospects of prolonged and permanent freedom from recurrences and complications.
6. Congestive phenomena. The presence of purplish discoloration and distended varicosities on the feet and over the internal malleolus or inner and lower part of the shin indicates a serious degree of reflux in the saphenous system. These are often strong indications for operative treatment.
7. Other complications of valvular incompetence. The other complications of valvular incompetence—dermatitis, ulceration, and phlebitis—are not considered in detail, but it is obvious that when dermatitis and ulceration occur the indications for operative treatment already given may apply with added force.

When treatment is started the veins and their tributaries are marked with a special skin ink, and the skin is prepared on the night before operation and again the following morning. The author prefers the use of general anesthesia. The various operative procedures, namely, saphenous ligation, ligation of collateral branches, and excision of colossal or tortuous varices, are discussed. Hemostasis must be perfect.

Injections are begun three or four weeks after operation. The author recommends quinine urethane because of the greater certainty of its thrombosing action. Injections may be carried out daily, with alternation of the limbs.

One of the most important factors governing the prognosis is the completeness of treatment. The tendency toward varicosity cannot be eliminated; but by securing complete obliteration of the varicose circulation the progress of the disease is retarded because of the elimination of aggravating mechanical factors.

SAMUEL H. KLEIN, M.D.

Batson, O. V.: The Role of the Vertebral Veins in Metastatic Processes. *Ann. Int. Med.*, 1942, 16: 38.

Following an earlier report of vein-injection studies in cadavers and in living monkeys, the author has had experience with over 100 anatomical injections. In male cadavers injection of the deep dorsal vein of the penis, performed as an anatomical laboratory routine, has made possible a study of the route of spread from the prostatic veins. Additional information was obtained from studies of the spread of material injected into the veins of the female breast. "The vertebral vein system consists of the

epidural veins, the perivertebral veins, the veins of the thoracoabdominal wall, the veins of the head and neck, and the veins of the walls of blood vessels of the extremities. It is a set of valveless vessels which carries blood under low pressures. In the subcutaneous tissue the smaller vessels provide a continuous network permitting ready permeation. Around the vertebral column the vascular bed of the system is much larger than required by the parts in which it is found. It is a system which is constantly subject to arrests and reversals in the direction of the flow of blood. The vertebral vein system parallels, connects with and provides by-passes for, the portal, the pulmonary, and the caval systems of veins and hence can provide in itself a pathway for the spread of disease between remote organs."

WALTER H. NADLER, M.D.

Welch, C. E., and Faxon, H. H.: Thrombophlebitis and Pulmonary Embolism. *J. Am. M. Ass.*, 1941, 117: 1502.

The authors note that intravascular complications of surgical operations are common and to a great extent mysterious. They point out that phlebitis and embolism are uniform enough in many cases to indicate the value of certain procedures designed either to prevent the disease or to treat it after it has developed.

In dealing with postoperative phlebitis careful attention must be paid to correct any abnormalities such as cardiac failure, electrolyte imbalance, and anemia. Varicose veins should be ligated and stasis of the blood stream must be avoided by frequent active movements of the legs in bed.

Ochsner has distinguished between thrombophlebitis, with its clear-cut signs of intravascular inflammation, and phlebothrombosis in which tenderness is slight and the temperature only slightly elevated. Theoretically, the diseases should behave differently. The ultimate results of the former should include more edema and more postphlebitic ulcers, while pulmonary emboli should be more common in cases of phlebothrombosis, in which the clot is not firmly anchored to the wall of the vein by inflammatory changes.

While a few cases can clearly be defined as either phlebothrombosis or thrombophlebitis, the majority are equivocal. The authors have found it impossible to attempt a definite separation but have called all cases of intravascular inflammation or thrombosis by the loose term "phlebitis." It has been found to be much more important to locate the area of the vein involved in the pathological process. For all practical purposes, this means that either the deep or the superficial veins should be specified as the site. Frequently deep phlebitis extends to involve portions or all of the superficial systems, while the reverse is occasionally true. Clinical differentiation is therefore often difficult. Superficial phlebitis is easy to diagnose by the presence of tender subcutaneous thrombi along the course of the saphenous vein, but the detection of deep phlebitis may be difficult. The importance of the diagnosis of deep phlebitis is exactly in reverse ratio to the ease with which it can be made. Edema of the lower leg usually signifies thrombosis of the popliteal and lower portion of the femoral vein, while edema of the thigh indicates that the thrombosis extends at least as high as the external iliac vessels.

Laboratory studies are disappointing. The white count is extremely variable and undependable as far as diagnosis is concerned. The method of venography developed by Dos Santos and elaborated by Bauer is a valuable guide in the diagnosis.

Superficial phlebitis may occur spontaneously after direct trauma or after operation. The best therapeutic procedure consists of ligation and division of the involved saphenous vein at its junction with the femoral or popliteal, as the case may be. Ligation is urged for three reasons. If the thrombosis is allowed to progress without treatment there is a tendency for the clot to progress proximally. This may result in a thrombosis of the femoral vein; it may be prevented by section of the saphenous vein. There is no doubt that pulmonary emboli may originate from thrombi in the saphenous systems and that 0.5 per cent of all fatal emboli originate from this source. After ligation, the patient is immediately ambulatory and may be discharged the day after the ligation is performed unless there are other reasons for keeping him in the hospital.

The problem of deep thrombophlebitis is much more complicated than that of superficial phlebitis. Emboli are more common and more serious. The well known sequelae of phlebitis, edema and ulcer, follow deep, rather than superficial, phlebitis. Pulmonary emboli vary in size and clinical symptoms. Reduction in the number of pulmonary emboli will require increasing attention to the veins of the lower extremities.

The authors discuss and describe the procedures for treatment. The operation of ligation of the femoral vein has appealed more strongly to them than other types of procedures. They believe that the immediate decision to be made in any given case of thrombophlebitis is whether the patient should be treated conservatively or by ligation of the vein. If conservative therapy is employed, lumbar injection of procaine hydrochloride should be done if vasospasm is considerable. If the deep venous channels are interrupted, heparin is often of value administered postoperatively. It must be emphasized that these concepts may be modified greatly as experiences increase. The important fact is that thrombophlebitis is no longer observed passively but is now accepted as a disease that must be considered seriously and treated vigorously.

HERBERT F. THURSTON, M.D.

Fine, J., and Sears, J. B.: The Prophylaxis of Pulmonary Embolism by Division of the Femoral Vein. *Ann. Surg.*, 1941, 114: 801.

The purpose of this communication is to offer evidence that division of the femoral vein is ad-

visable as a routine prophylactic measure against pulmonary embolism when thrombosis of the deep veins of the lower leg is found to be present or is suspected.

Thrombosis of the deep veins of the lower leg is the focus of origin of the great majority of pulmonary emboli.

Pulmonary embolism until recently has been regarded as a dramatic postoperative catastrophe for which adequate prophylactic or therapeutic measures are not available. This is no longer tenable except in the case of massive embolus which has occurred in the absence of detectable signs of venous thrombosis of the lower leg, and in the absence of a previous episode of embolism.

If the surgeon will conscientiously observe the patient from the very beginning and throughout the postoperative period for the signs and symptoms of phlebitis in the deep veins of the lower leg, he is likely to discover the existence of at least suspicious evidence of phlebitis in advance of the discharge of an embolus, in a much larger number of instances than heretofore.

If the evidence of phlebitis in the lower leg is clear-cut, immediate division of the femoral vein below or above the profunda should be done (bilaterally if both legs are involved). If embolism has not yet occurred, the procedure may be considered a justifiable prophylactic measure. If an embolus has been discharged, however massive it may be, so long as it is not fatal, immediate division of the femoral vein is the one most effective measure remaining to prevent the discharge from its commonest source of still another embolus, which may prove fatal.

If the evidence of phlebitis is only presumptive, a decision can be reached by the venographic technique of Bauer.

If embolism has occurred in the total absence of signs or symptoms of phlebitis, the process will usually be demonstrated and lateralized by the venographic technique of Bauer. An embolus, henceforth, can be assumed to have arisen from the pelvic or other inaccessible veins only when no involvement of the deep veins of either lower extremity is shown to exist by employment of this technique.

There is no good evidence that division of the femoral vein involves any significant immediate risk, or adds to the disability created by the phlebitis itself. On the contrary, aside from its prophylactic value for embolism, division appears to exert a favorable influence on the course of the disease, probably because of the concomitant disruption of some of the pathways involved in the accompanying vasospastic reflexes.

Because pulmonary infarcts and fatal pulmonary embolism from phlebitis of the lower leg occur frequently in nonsurgical as well as surgical patients, the therapeutic problems involved become the concern of the internist as well as the surgeon.

PAUL MERRELL, M.D.

Ravdin, I. S., and Wood, F. C.: The Successful Removal of a Saddle Embolus of the Aorta Eleven Days After Acute Coronary Occlusion. *Ann. Surg.*, 1941, 114: 834.

The authors give a case report of a patient who was thirty-two years of age when he first had the symptoms of a cardiac infarction in the anterior surface of the left ventricle. This condition was treated and on the eleventh day following its inception there were symptoms of a saddle embolus of the aorta at its bifurcation in the iliac vessels. Embolectomy was done in less than three hours after the symptoms had begun.

The authors discuss the operative techniques and instruments found useful in the procedure. They also discuss the use of heparin in such a case and advise that protamine may be used when one wishes to bring the coagulation time back to normal rapidly. They also discuss briefly the use of conservative measures such as paravertebral sympathetic block to relieve vascular spasm distal to the arterial obstruction, and suction and pressure therapy to promote circulation in the affected extremities.

PAUL MERRELL, M.D.

BLOOD; TRANSFUSION

Maizels, M.: Clotting and Filtration of Citrated Plasma. Weaker Citrate Solutions as Anticoagulants; Clotting by Dialysis. *Lancet*, 1941, 241: 722.

The disadvantage of unfiltered citrated plasma is that even with the most careful processing it sometimes becomes infected; and since sterile unfiltered plasma is naturally cloudy, infection cannot be detected by observation alone. For this reason filtration has special advantages; it considerably reduces the risk of infection and leaves the material clear so that infection can be detected by the appearance of opalescence. Filtration of plasma, however, presents difficulties. Clotting is apt to occur and to limit the amount of fluid that can be passed through a filter. This clot develops sooner or later when the filtered material is stored at room temperature. The mechanism of this clotting is obscure and differs from that of physiological clotting. The difficulties of storing filtered plasma have resulted in an extensive use of filtered serum, but there is still a need for a method of converting filtered citrated plasma into a product which, though fluid, is still quite stable.

The method of clotting and filtration here described combines the processes of Clegg and Dible and of Picken. The objection to the former method is the high calcium content of the end-product, and to the latter the economical factor that five volumes of serum are required to clot one part of the plasma.

Maizels found that combined serum and calcium produce clotting with an economy of serum and with only a moderate increase of total calcium in the end-product. The five mixtures of serum,

plasma, and calcium in Table I will all clot completely. It is not possible to state without clinical trial which of these mixtures is most suitable for use. The first four have low calcium content, and the second and third are economical of serum. The method used in preparing the third mixture is described in detail.

TABLE I.—CALCIUM REQUIRED TO CLOT MIXTURES OF SERUM AND PLASMA

Serum (parts)	Plasma (parts)	Calcium added	Final calcium
		mgm. per 100 cc.	
2	1	9	18
1	1	15	23
1	1.5	19	27
1	2	23	31
0	1	46	53

One of the advantages of this method is that in the ordinary separation of serum only the cell-free upper portion of serum is used, and a considerable cell-rich residue is left behind which is usually wasted. When serum is used to clot plasma the whole serum including the dregs can be used and the therapeutic value of the serum is added to that of the plasma. It is also possible to divert the clear upper serum into one vessel for filtration and storage as serum and to use the blood-stained residue to clot plasma.

No definite figures can be given for the amount of calcium required to clot a given mixture of serum and plasma. This will vary with the amount of thromboplastic materials present and with the relative amounts of citrate and calcium in the plasma after storage. The figures in the table allow a certain margin of safety.

High citrate concentrations in anticoagulants are efficient in stabilizing plasma after filtration through bacterial filter pads, but they are disadvantageous if the material is to be converted into serum with either calcium or serum or a calcium-serum mixture. If the straight filtration of plasma were ever abandoned in favor of a conversion to serum before filtration, a weaker citrate preparation, the formula of which is given, would be suitable. This would allow reduction in the amount of calcium required to produce complete clotting.

Citrated plasma may also be clotted by dialysis against 2.75 volumes of saline containing 15 mgm. per 100 cc. of calcium. This method does not require serum and the final calcium is only slightly greater than normal. The decrease in crystalloids which occurs may be of physiological importance. Clotting plasma by dialysis is still experimental, and it is not certain that consistent asepsis can be maintained during the processing. At present the use of mixtures of calcium and serum is the method of choice.

JOHN L. LINDQUIST, M.D.

SURGICAL TECHNIQUE

WAR SURGERY

Stuppell, R.: Memorandum on War Surgery at the 53rd General Hospital, Sudan. From January, 1941 to April, 1941. *J. Roy. Army Med. Corps, Lond.*, 1941, 77: 283.

The author discusses 311 war casualties admitted to a general hospital. The wounds treated fell into 4 groups:

1. Through-and-through bullet wounds with a small point of entry and exit.
2. Through-and-through splinter wounds with a small point of entry and a large ragged point of exit.
3. Perforating splinter wounds with a minute point of entry and a large lacerated cavity within the limb, out of all proportion to the size of the wound on the skin.
4. Lacerated tangential wounds with considerable destruction of tissue.

Wounds of the first group may be practically sterile and heal almost by primary intention, or the bullet track may be filled with blood. If this blood should not be evacuated, it becomes infected. To prevent this, it is sufficient to draw a piece of gauze through the bullet track and thus clear out the blood clot. The closed plaster method was almost universally employed for wounds of the limbs after preliminary débridement. In the early cases, the wound was lightly packed with vaselined ribbon gauze and then the whole limb was encased in an unpadded plaster cast. However, these cases developed a pyrexia after a few days. This was found to be due to the packing which acted as a plug and caused retention of the pus. In later cases, therefore, only the surface of the wound was covered with a layer of sterile vaseline gauze to protect it from the plaster cast. No antiseptics of any kind were used in the wound.

Wounds that were thoroughly opened and permitted free drainage, provided they were adequately immobilized, progressed smoothly and healed with much greater rapidity than was expected.

All necrotic and injured tissue was excised as freely as possible, but not too much time should be spent in attempting to remove every particle of infected matter. If the fever did not subside within three or four days, the plaster cast was removed and a search made for the cause of the fever. Usually it was due to the presence of a pocket of pus. This was opened, and the plaster cast reapplied.

In infected fractures, also, it was found inadvisable to pack the wound with gauze, which served more to prevent than encourage drainage. The wound, however, should be protected from the plaster cast by gauze, because otherwise the granulation tissue tends to grow into the interstices of the plaster, and is very painful when removed.

In fractures of the hand, it is essential to provide for free motion of the uninjured fingers, since these tend to become stiff otherwise.

Compound fractures of the femur were treated by thrusting a steel pin through the tibial tuberosity and applying traction on the limb until the measurements on both sides were equal.

In skull injuries, the following points of interest were noted:

1. A deceptively small and innocent looking wound may be associated with a fracture and the retention of a missile within the cranial cavity.
2. Primary suture of wounds of the scalp is dangerous and is likely to be followed by a spreading infection.
3. Considerable damage may have been done to the contents of the skull with no visible evidence of external injury.
4. The intense headache, which may be a late result of blows to the head, may be greatly relieved by the administration of a saturated solution of magnesium sulfate in water per rectum.

Penetrating wounds of the chest fell into 3 groups:

1. Traversing wounds with a small point of entry and exit, and without hemothorax.
2. Traversing wounds with a closed hemothorax.
3. Penetrating wounds with an open pneumohemothorax.

Cases in the first group presented the clinical picture of pneumonia, and did well under medical treatment. Those in the second group were treated by repeated aspiration of blood from the pleural cavity and replacement with air. In several cases, the hemothorax became infected, and had to be treated by rib resection. The third group presented the same complications as the second, with the added danger of the sucking wound, which had to be closed.

SAMUEL KAHN, M.D.

Aita, J. A.: Neurological and Psychiatric Examination During Military Mobilization; Results and Suggestions Derived from a Study of 9,652 Men. *War Med.*, 1941, 1: 769.

The author points out the significant neurological and psychiatric material that was found in a group of 9,652 men examined at an induction center. In this group there were 242 disqualifications for neuropsychiatric reasons.

Perhaps even more interesting than the disqualified group are the borderline candidates. It is suggested that this group needs more attention. Confronted with these men, one should be much concerned with the prognostication in the cases of the borderline candidates who are accepted. There is considerable encouragement to make definite predictions since notations of neuropsychiatric significance could be made on more than 20 per cent of nondisqualified men, which thus allows a substan-

tial group for later study of the extent of agreement of the predictions with their service behavior. It is believed that with some recording facility one should be able to rate each man prognostically as good, fair, or questionable material and briefly state the reasons why. Such records will soon permit a far better analysis of our present endeavors.

There is need to plan the future activities of the Medical Department now, particularly for the prevention and treatment of such insidious, poorly understood, and debilitating diseases as neuropsychiatric disorders are found to be. It will be five or ten years before medical examiners will be certain that they are now doing any better than was done from 1917 to 1919. The present emergency may be over then, and it is advantageous to learn many things before that time in order to reap some benefits now and to avoid the high incidence of military psychiatric problems.

David, M., and Ferey, D.: The Activity of the Neurosurgical Center of the Second Army; Treatment of Craniocerebral Injuries (Sur l'activité du Centre neuro-chirurgical de II[e] Armée. A propos du traitement des blessures cranio-cérébrales). *Mém. Acad. de chir.*, Par., 1940, 66: 668.

David and Ferey report that from May 10 to June 12, 1940, 389 cases of craniocerebral injury were admitted to the Neurosurgical Center of the Second Army, and of these 288 were operated on. One hundred and one were not operated on, either because the patient's condition was too unfavorable for operation, or because the wounds were superficial and required only dressing. In most cases the projectile causing the wound struck the temporo-occipital region, and more frequently on the left than on the right side.

Each patient on admission was warmly covered, his wounds dressed, and antishock treatment given if necessary. An x-ray examination of the head was made, and a careful neurological examination, as far as possible. The decision to operate depended on the roentgenological and clinical findings and the patient's condition. Delay in operation is justified in craniocerebral injuries if the patient is in coma with abnormal respiration, and with fever above 39°C.; also when there is definite hypertension, and when there is marked infection of the cerebral wound. The latter was rarely observed in the authors' series, as most of the patients, fortunately, were brought to the Center within twenty hours after being wounded. Operation was done immediately, as an emergency measure, whenever there was evidence of damage to a venous sinus, of opening of a ventricle, of marked cerebral edema, or of progressive hemorrhage. Operation was usually done immediately also in cases of large open wounds, with or without cerebral hernia; but immediate operation in these cases is not of so great urgency as in most war wounds of other organs. The authors have operated on such wounds after twenty-four, or even forty-eight, hours without the development of secondary infection. This result may be attributed in part to the systematic use of the prophylactic administration of the sulfonamide dagenan in large doses. If the patient has multiple wounds, operation on the head wound may be deferred until wounds of the viscera or of the extremities are first treated. These injuries usually demand more urgent treatment and the use of a general anesthetic.

In the authors' operations on craniocerebral wounds, local anesthesia was almost always employed. In operations on craniocerebral wounds, as in operations on cerebral tumors, the use of the electric knife was found to be of great advantage, both for the removal of tissue and for hemostasis; the dura mater was carefully repaired and closed.

After operation, nursing care proved of great importance, as patients must be kept very quiet; but in general the authors found that these wounded patients recovered more promptly and with fewer complications than patients operated on for brain tumor. Both hemorrhage and infection were of rare occurrence; the low incidence of infection, as noted above, was attributed to the administration of dagenan in large doses from the time of admission; the dosage for the first two days was 6 gm.; for the next two days, 4 gm.; and for the last two days, 2 gm. ALICE M. MEYERS.

Rose, T. F.: Air-Raid Injuries of the Chest. *Med. J. Australia*, 1941, 2: 465.

A relatively small percentage of total injuries of the chest reach the surgeon because of the high mortality of these injuries. Although it would be desirable to have this type of injury handled by a chest specialist, it is not practical and it is impossible from the standpoint of transportation. Usually chest injuries are urgent and need prompt attention.

They may be caused by: (a) the bomb itself, (b) machine-gun bullets, and (c) shrapnel falling from antiaircraft shells. The types of injuries due to these three causes are quite varied. For example, a bomb may produce injury through flying shrapnel from its casing or an individual being thrown against some object. A lung blast injury itself may result. An individual may also be hurt by falling buildings, by objects causing crushing injuries, or by flying objects. The type of injury, therefore, depends upon the surroundings.

The author classifies injuries as penetrating and nonpenetrating wounds of the chest (when injuries of the heart and mediastinum are excluded). The chest wound may also be only one of several present.

Penetrating wounds vary according to the object causing them, which usually carry dirt and clothing into the chest. They may traverse the chest entirely or involve other parts of the body at the same time. Hemorrhage and pneumothorax are usually present.

Nonpenetrating wounds vary in character according to the force of the object. Ribs may be fractured. Hemorrhage from torn intercostal vessels or from the lung is common. Pneumothorax may result from a lacerated lung and massive collapse

may result from an injured bronchus. Lung blast caused by the force of the concussion may lead to sudden death or to the occurrence of subpleural hemorrhages.

Treatment. The author divides treatment into immediate, and that applied after the patient enters the hospital. The former includes an aseptic dressing to the wound, strapping of the chest when it is unstable from fractured ribs, and the release of tension pneumothorax by the introduction of an aspirating needle. In sucking wounds obvious foreign bodies should be removed and the visible bleeding controlled. The latter may be from an intercostal vessel and can be controlled by ligating around the rib proximally and distally to the point of bleeding. Morphine is needed before a patient is transferred to a center for further care. Shock should receive the first treatment by the use of plasma and blood. Warmth and, in some cases, oxygen is very important. Antitetanic serum and gas-gangrene antiserum should be given. Certain wounds demand priority—sucking wounds, severe internal hemorrhage, and wounds of the lower thorax which are apt to involve the abdomen.

In hospital treatment of nonpenetrating wounds the aim is (a) to control hemorrhage and combat shock, (b) to prevent or relieve tension pneumothorax, and (c) to mobilize the chest wall in case of fractures. Pneumothorax and hemothorax should be left alone when causing no symptoms and aspirated later according to the symptoms.

Patients requiring operation should be prepared by blood or plasma infusion and sulfapyridine. Some form of positive-pressure gas anesthesia administered through a snug-fitting face piece is desirable. For penetrating wounds, except when through-and-through and the symptoms are minimum, most cases require operation as soon as the patient's condition permits. The wound should be excised radically, both soft parts and rib fragments, and perhaps dusted with sulfanilamide powder. A separate incision at the sixth or seventh interspace may be needed to obtain exposure. Foreign bodies should be removed as well as clotted blood. Lacerated lung tissue should be excised and the pleural space drained on closure.

In gaping wounds the hole may be too large for suture, in which case packing with strips of gauze or suturing the lung to the chest wall will help to close the opening.

In associated abdominal and thoracic wounds the latter are cared for first if at all severe. These wounds are usually worse on the left side because of involvement of the hollow viscera. They are usually explored through the eighth rib bed and the abdomen is explored through an opening made in the diaphragm.

Complications of penetrating wounds of the chest are chiefly due to infection and hemorrhage and are to be treated on the basis of the principles which have been outlined previously.

WILLIAM E. ADAMS, M.D.

Ogilvie, W. H.: The Treatment of Abdominal Wounds. *J. Roy. Army. Med. Corps, Lond.*, 1941, 77: 299.

The surgery of abdominal wounds in wartime is of importance not only because of its operative implications. It is important to the morale of an army and as an index of military medial efficiency.

Abdominal surgery in wartime differs from that in peacetime because of the complexity of the wounds. Any organ or combination of organs can be injured in any way and frequently by wounds that do not appear to be abdominal at all.

The author believes that every man who is wounded in the abdominal cavity must be considered as certain to die unless he is operated on and operated on early. Men who make satisfactory recoveries following abdominal wounds are seldom permanently incapacitated or prevented from continuing a useful life.

Operation should be done within six hours of injury and the investigation of a patient with an abdominal injury must be brief and purposeful. Every case presenting abdominal symptoms must be considered as an abdominal wound until proved otherwise. Four groups of wounds are apt to cause difficulty in this respect: thoracic wounds, spinal lesions, abdominal contusions, and blast injuries.

Thoracic wounds are often accompanied by abdominal pain and rigidity and may or may not be abdominothoracic. In general, wounds limited to the thorax are accompanied by strictly unilateral rigidity. The rigidity is variable and tends to decrease. Purely alimentary symptoms such as vomiting and distention are absent and the general condition of the patient tends to improve unless there is an open pneumothorax or progressive bleeding.

Spinal injuries may produce referred abdominal pain and sometimes rigidity, and it is of importance to test the sensation and movement of the legs when the projectile has passed near the spine since an abdominal operation on a paralyzed patient is unfair to the man whose turn comes next.

Abdominal contusion may be accompanied by tears of the spleen and liver and rupture of the small intestine. Contusions of the abdominal wall will have associated shock, localized tenderness, and muscle defense. If the injury is limited to the abdominal wall the shock will decrease rapidly with rest and heat, and the tenderness and muscle defense will not increase.

"Blast abdomen" occurs in patients who are subjected to a sudden increase in the pressure of their surroundings and produces the clinical picture of acute general peritonitis. There may be actual intestinal perforation but more often one finds multiple subperitoneal hemorrhages throughout the abdomen. Careful observation and abdominal auscultation may permit a distinction. A silent abdomen is an abdomen in need of laparotomy.

Preliminary treatment for shock must be instituted before operation but this should usually not require more than two hours at the most.

External wounds should be excised but the intra-abdominal procedure is of primary importance. If some of the wounds are on the back, they should be dealt with first to avoid all unnecessary movement of the patient after laparotomy. When the original wound can be enlarged for approach to the abdominal cavity, this should be done after excision of the wound. The recommended incisions for abdominal exploration are the right and left paramedian and the midline infraumbilical incisions.

Fine silk and lined thread have many advantages over catgut for ligatures. They are cheap, easily sterilized, easily transported, and their knots more reliable.

When the abdomen is opened the first steps should be taken toward the arrest of any hemorrhage. Next, all perforations of the gastrointestinal tract should be sought and closed. All solid viscera must be carefully inspected as well as the retroperitoneal areas. After all lesions have been identified the necessary repairs are undertaken. At the conclusion of this, the abdominal cavity is mopped clean, rinsed, and dusted with sulfathiazole powder. The abdomen is then closed with or without drainage.

Perforations of the small intestine should always be sutured if possible and a single purse-string suture or a single layer of interrupted invaginating sutures usually suffices. Bowel resection should be done only when necessary.

Small perforations of the colon should be carefully sought because they are more serious than those of the small intestine. Holes in the free portions of the colon may be closed by purse-string sutures if the surrounding bowel wall is healthy, but in most cases a local repair is unsafe and resection is advisable. The author does not advocate end-to-end suture with or without cecostomy but prefers to resect the injured segment and bring the two cut ends out to the surface at one end of the incision as a double-barreled colostomy.

Wounds of the stomach can generally be closed by suture, but those near the pylorus may, when sutured, produce obstruction of the lumen and in these wounds gastrojejunostomy is recommended.

Wounds of the liver, if bleeding or if encountered as part of another wound, should be cleansed of blood clots. Pressure should be applied and if they are of moderate size they should be closed by sutures tied over a free edge of omentum laid in the gap. Large wounds should be packed.

Bleeding from the spleen may cease spontaneously or be controlled by suture but may frequently recur. For this reason splenectomy is advocated in every case.

The kidney withstands the impact of projectiles relatively well. It does not tend to fragment, or bleed profusely or long unless its main vessels are injured; it has good resistance to infection and good powers of recovery. Nephrectomy is rarely indicated. In most cases drainage of the perinephric space suffices. Nephrectomy is necessary when there is division of the ureter, injury to the main vessels, profuse or persistent hemorrhage, or more damage than is compatible with recovery of function.

Wounds of the bladder or rectum must be sutured. After suture both the bladder and rectum should be drained, the former by a suprapubic tube, the latter by colostomy. EDWARD W. GIBBS, M.D.

Maitland, A. I. L.: A Case of Crush Injury with Recovery. *Lancet*, 1941, 241: 446.

A detailed report is made of a case of crush injury, the patient being a previously healthy male of forty years who developed severe renal insufficiency as a result of his being pinned for fifteen hours under the debris of a bombed building. In addition to crush injuries of his right thigh and right side of his trunk, he also had a lesion of his right brachial plexus and pulmonary concussion.

Treatment in previous cases of this type had been limited to the usage of serum, concentrated serum, plasma, or whole blood. The different approach, tried in the case reported, consisted of complete protein starvation and the forcing of fluids. Protein starvation was used because the biochemical findings in these cases suggested that more products of protein autolysis were being thrown into the circulation than the damaged kidneys could eliminate. It was thought reasonable, therefore, not to burden the circulation with more protein, until there was evidence that it could be utilized and its end-products excreted. Every form of protein was withheld for eighteen days, after which a low protein diet was given. A normal diet, free of protein restrictions, was started on the thirtieth day.

During the first few days intake by mouth was small; most of the fluid was given intravenously, in the form of isotonic sodium-sulphate solution. Despite considerable fluid intake, the output was small and the blood urea mounted steadily. When the blood urea reached a level of 400 mgm. per cent, on the sixth day, it was believed that the risk of death from pulmonary edema was less than that from uremia, so fluid was pushed by every available route.

Because of the uremia, rectal fluids were not given successfully until the eleventh day. However, the patient was soon able to drink from 5 to 6 pints a day. Hartmann's solution was used in the later stages because it resembled blood plasma yet lacked protein elements; sodium sulphate was not used once the daily urinary output totalled 2,000 cc.

In view of the extensive necrosis of muscle and the lesions of the adrenal cortex reported in this type of case, suprarenal cortical extract was given from the start: 4 cc. of eucortone, daily for twenty-four days, then 5 cc. daily for eight more days.

In his discussion, the author points out that the most striking feature of this case was the large amount of fluid retained between the seventh and fifteenth days. About 25.5 liters were retained without either any great increase in the swelling of the limbs, resulting from the trauma, or the appearance of anasarca. Edema appeared on the sixteenth day, reaching its maximum between the nineteenth and

twenty-second days. It was thought that this retention could not be ascribed entirely to the cortical extract given, since the bulk of the fluid remained in circulation for at least six days. It must therefore have been required as a diluent of some abnormal substance in the blood, probably a high molecular protein derived from the damaged muscle.

The lesion associated with the crush syndrome was situated in the convoluted tubules and loops of Henle which receive their blood supply from capillaries arising from the efferent glomerular arteries; the blood supply of this area thus came through the reducing chamber of the glomerular capillary bed. Not only was the pressure reduced, but the blood was also concentrated by the loss of fluids, and the solids secreted by the glomerulus. As a result of this and of the fact that in all the cases of crush injury described severe shock has been present, it is suggested that this will produce a vicious circle of vascular stasis, hemoconcentration, and thus more stasis in the capillaries of the convoluted tubules. These changes will be intensified both by the absence of fluid intake during the "buried period," and the flooding of the circulation with a protein of high molecular weight from the damaged muscle. Experimentally, it has been shown that a rapid elevation of blood pressure during the recovery period may produce further tubular damage by intensifying the stasis in the vessels supplying the convoluted tubules.

The following clinical observations are adduced to support the author's hypothesis: (1) the invariable presence of abnormality in the first specimen of urine examined; (2) the common critical point in all cases between the sixth and eighth days; (3) the fatal termination in 1 case, despite amputation of the crushed limb; and (4) the recovery in 2 severe cases, with general measures only, during the first twenty-four hours, followed by the usual treatment of congestive renal failure.

Four months after the injury, the patient appeared to have made a good recovery, in spite of an intercurrent bronchopneumonia and a streptococcic throat infection. An anemia has persisted despite treatment, suggesting some renal damage not evident to tests of function. The affected thigh, though anatomically normal, has lost almost all its extensor power.

EUGENE J. AUDI, M.D.

Dunn, J. S., Gillespie, M., and Niven, J. S. F.: Renal Lesions in 2 Cases of Crush Syndrome. *Lancet*, 1941, 241: 549.

The authors report their findings in 2 fatal cases of crush syndrome. Both cases were air-raid casualties with severe crushing of the limbs under debris. These cases were characterized by a condition of acute selective damage of the lower segments of the kidney. Histological examination of the kidney in both cases showed (1) the presence of brown casts resembling hemoglobin in the second convoluted tubules, and (2) definite epithelial alterations in the ascending limbs of Henle and in the second convoluted tubules. The most severe damage was apparent where the lower nephron segments lay in close proximity to the veins.

In the diseases of man there is no parallel for a condition of acute selective damage of the lower segments of the kidney. It is difficult to explain the pathogenesis of a lesion of this kind. Evidence drawn from experimental lesions in animals may help to elucidate this problem. In 1926 Dunn and Polson showed that by introducing large doses of uric acid in solution, in the form of lithium monourate, into the circulation of the rabbit, severe selective damage could be produced in the ascending limbs of Henle, the second tubules, and to some extent in the collecting tubules, while the first convoluted tubules remained normal in appearance. More recent experiments, (McFarlaine, 1941) have shown that in the experimental phosphate nephritis of rats, the lesion again is almost restricted to the lower kidney segments. The special localization of lesions at this level may be due to change of reaction in the filtrate, together with an increase of concentration effected at higher levels.

In the 2 cases under discussion it seems possible that a substance of special toxicity was produced in the presence of acid. As yet nothing certain is known of the nature or source of any toxic agent which may be responsible for the renal damage in cases of crush syndrome. Most observers adhere to the view that after release of the affected tissue from a compressed and more or less ischemic state, something toxic is absorbed from it into the circulation as the vessels reopen and that the toxic agent affects the kidney in the course of excretion. Naturally, the number and kinds of possible toxic agents which could so arise are conjectural. It is possible, too, that the cast material, which apparently contains myohemoglobin, may be toxic in character. Further experimentation will no doubt throw more light on the genesis of this condition.

MATHIAS J. SEIFERT, M.D.

Stewart, S. E.: The Antigenic Value of Clostridium-Perfringens (Clostridium Welchii) Toxoid in the Prevention of Gas Gangrene. *War Med.*, 1942, 2: 87.

Clostridium-perfringens toxoid of good antigenic value, as determined by animal inoculation and by the degree of antitoxin binding power, can be prepared as follows:

Filtered toxoid is precipitated with a 70 per cent saturation of ammonium sulfate, and the precipitate is dissolved in a quantity of distilled water not exceeding one-twentieth of the original volume of the toxoid, and dialyzed in running water for forty-eight hours. The dialysate is then made up to one-tenth of the original volume of the toxoid, refiltered through a Berkefeld filter and precipitated with a 1 or 2 per cent solution of alum. After it is washed in a solution of sodium chloride, the precipitate is concentrated to one-tenth of the original volume of the toxoid.

Good toxin can be produced in a casein hydrolysate medium containing extracted ground beef.

The nitrogen content of toxoid prepared in this medium is about one-half that of toxoid prepared in a peptone-beef infusion meat medium.

Guinea pigs with circulating antitoxin as a result of active immunization are protected against many lethal doses of clostridium-perfringens toxin or clostridium-perfringens culture given intraperitoneally or intramuscularly.

Guinea pigs exhibit marked differences in susceptibility to intraperitoneal and intramuscular injections of clostridium-perfringens culture.

SAMUEL KAHN, M.D.

Hawking, F.: Methods for the Local Application of Sulfanilamide. *Brit. M. J.*, 1941, 2: 685.

Various practical methods are described for the local application of sulfanilamide or sulfathiazole. In shallow open wounds a powder is most satisfactory; by means of a spoon, pepperpot, or insufflator the whole surface should be covered liberally. In narrow, deep sinuses which are packed at regular intervals the powder can be inserted deeply on the packing; small tablets made of the compressed compound permit transfer of the drug to the bottom of a deep sinus. To treat inflamed surfaces, burns, and wounds which must be packed various pastes may be used. Three pastes are provisionally recommended to suit three different types of lesions requiring, respectively, a thin, medium, or stiff paste.

WALTER H. NADLER, M.D.

OPERATIVE SURGERY AND TECHNIQUE; POSTOPERATIVE TREATMENT

Olson, W. H., Gutmann, H., Levinson, S. O., and Necheles, H.: Circulating Time in Shock. *War Med.*, 1941, 1: 830.

The use of sodium cyanide (the reaction time method) for measuring the circulation time proved to be a simple and rapid method of detecting early changes in shock and incipient shock. These changes were found to affect the circulation time very early; in fact, as compared with other chemical and biological tests such as those of the blood pressure, plasma carbon-dioxide volume, hemoglobin, plasma protein, hematocrit, and the specific gravity of whole blood, the circulation time showed much earlier and more striking changes.

The cyanide method consists of the intravenous injection of a small quantity of sodium cyanide and the measurement of the time elapsing between the injection and the response of the chemoreceptors of the carotid sinus, which stimulate respiration. In the authors' experiments, anesthetized dogs were used as experimental animals. The blood pressure and respiration were recorded. Shock was produced by traumatizing the hind leg of the anesthetized animal. One milligram of sodium cyanide was found to produce easily detectable changes in the respiration, this dose being injected into the femoral vein and the elapsed time for respiratory changes to occur being recorded. Occasionally minor temporary blood-pressure changes occurred following the cyanide injection, but the dose used was never toxic and a smaller dose produced respiratory changes without influencing the blood pressure. More than 400 determinations of the circulation time were made, and the results were then compared with various other types of chemical and biological tests made simultaneously.

The circulation time for normal anesthetized dogs ranged between six and fifteen seconds, the circulation time for most dogs being from nine to thirteen seconds. After varying amounts of trauma, the circulation time ranged from sixteen to fifty-eight seconds, with the majority of dogs varying from twenty to thirty seconds. The circulation time was similarly affected by burns and by prolonged anesthesia. This change in circulation time indicated impairment of the circulation, and probably was due in the early stages to increased capillary constriction and peripheral resistance for maintenance of the blood pressure.

During shock, the circulation-time increase, blood-pressure fall, and the plasma carbon-dioxide decrease closely paralleled each other in most experiments, although the circulation time showed the earliest and greatest changes. The specific gravity of the whole blood, the hemoglobin concentration, the hematocrit reading, and the plasma protein changes showed wide variations, and these tests were thought to be unreliable in regard to diagnostic indices of the severity of shock.

In order to eliminate the possibility that a latent period of the chemoreceptors in the carotid sinuses be responsible for changes in shock when using the cyanide test, the thyroid artery was exposed in several dogs and the injection made very close to the carotid sinuses before and after trauma. No change was observed in the reaction time from this injection, but the reaction time was very appreciably prolonged after the intravenous injection following trauma.

Intravenous infusions of the saline solution and of serum shortened the circulation time, the latter being of prolonged value.

From their experiments, the authors conclude that the determination of the circulation time offers a rapid and simple means of detecting early or impending shock.

LUTHER H. WOLFF, M.D.

Hart, D., and Upchurch, S. E.: "Unexplained" Infections in Clean Operative Wounds. *Ann. Surg.*, 1941, 114: 936.

The ten and one-half years covered by this investigation are divided into the three following periods: (1) five and one-half years prior to the introduction of bactericidal irradiation; (2) the transition period from 1936 to 1937, when the change to bactericidal irradiation was made; and (3) the period from 1938 to 1941, during which most of the extensive clean operations were performed in a field of sterile air.

In the first period, there were 1,735 clean cases operated upon without irradiation. Two hundred

and seven, or 11.9 per cent, of these became infected and 19 deaths resulted from the infection. Of the 2,463 similar cases operated upon under bactericidal irradiation since 1936, only 6, or 0.24 per cent, became infected, and there were no deaths caused by infection. Prior to the introduction of bactericidal irradiation every feasible improvement in technique to reduce infection was tried without notable results. Since the introduction of irradiation it has been possible to return to the use of silk in certain wounds.

The results of this report are based on the analysis of 1,313 selected clean operations, including 47 reopened thoracoplasty wounds done prior to the use of irradiation, and 2,803 similar cases, including 140 reopened thoracoplasty wounds as well as 200 potentially infected operative wounds, all performed with the benefits of bactericidal irradiation. Irradiation was restricted to larger operations at first but has lately been employed in most clean cases.

In the first period, 15,674 operations of all types were performed. Among these there were 17 deaths from infection developing in cases with a clean primary incision. In the last two periods, 30,695 operations of all types were performed. There were 2 deaths from infection in clean primary incisions in this group. However, as both were done in the transition period, neither of them had the benefits of irradiation.

For the past ten and a half years, 31.6 per cent of all the deaths from unexplained operating-room infection occurred during the three consecutive months, November, December, and January, and the 2 deaths in the irradiation period were in patients operated upon in December and April. In neither instance was irradiation used.

Irradiation was at first restricted to the larger operations. In the last two years it has been used in almost all of the clean cases, including hernia, thyroid, neurosurgical, orthopedic, and a group of miscellaneous clean cases. The results in these respective groups are summarized in the following table:

TABLE I.—INCIDENCE OF INFECTION

Operations	% Without Radiation	% With Radiation
Thoracoplasties, first stage and radical mastectomies	32.0	0.35
Orthopedic operations	16.5	0.74
Neurosurgical operations	9.0	0.22
Herniorrhaphies	8.3	0.00
Partial thyroidectomies	1.8	0.00

Since 1936, between 600 and 700 clean operations of a miscellaneous group have been performed under irradiation. In this group there was only 1 infection.

The authors emphasize the fact that prior to the use of bactericidal irradiation, the fear of infection not only limited the growth of many of the surgical services, but also definitely restricted the number of elective operations done during the winter months. Since irradiation this fear of infection has practically been eliminated and all services show a marked increase in the number of operations performed and that the seasonal incidence of infection is of little significance.

Of the 142 organisms identified, 127 were from 207 infected wounds in the series of 1,735 large clean cases performed without irradiation, 8 from the 140 reopened thoracoplasties which were done under irradiation, and 7 of the organisms were from 6 mildly infected wounds in the series of 2,463 operations done under irradiation. The staphylococcus predominated, comprising 91 per cent of the organisms causing infection. Eighty-three per cent of the staphylococci were the staphylococcus aureus. Beta hemolytic streptococci were present in only 5 per cent of the cases and only once in pure culture. Four, or 21 per cent, of the 19 deaths showed beta hemolytic streptococci in the wounds, but in none of these cases was it present in pure culture. The staphylococcus aureus was present in the wounds of 14 of the 19 patients who died as a result of the infection. In 11 of these 14 the staphylococcus aureus was present in pure culture in the wounds. In the irradiated cases which became infected, the infection was caused by the staphylococcus aureus or albus, except in 1 orthopedic case in which there was a mixed infection with the beta hemolytic streptococcus.

The death rate from unexplained infections was reduced from 1.07 per cent in 1,735 operations in the groups which were not irradiated to 0 per cent in the series of 2,463 cases operated upon under bactericidal irradiation.

The authors conclude:

"In wounds protected from air contaminants during operation by sterilization of the air with ultraviolet radiation, any type of 'unexplained' infection in a clean wound was extremely rare and never severe. This indicates that the organisms were present in smaller numbers, were attenuated or less virulent, gained access to only a localized part of the wound, or that the wound itself had an increased resistance to the infection."

ALFRED B. LONGACRE, M.D.

ANTISEPTIC SURGERY; TREATMENT OF WOUNDS AND INFECTIONS

Brooks, B., and Duncan, G.: The Influence of Temperature on Wounds. *Ann. Surg.*, 1941, 114: 1069.

This article reports the results of an experimental study of the influence of temperature on the reaction of living tissue to injury.

Three pairs of symmetrical skin points on the backs of anesthetized dogs were selected so that two of these points could be subjected to applications of heat, two to applications of cold, and two left at body temperature. At three of the points 0.1 cc. of oil in turpentine was injected intracutaneously

and at the other three points 0.1 cc. of a twenty-four hour broth culture of the staphylococcus aureus. Two areas of injection, one of turpentine and one of staphylococcus aureus, were maintained at a temperature of 10° C., two at 40° C. and two at body temperature of 37° C.

A few minutes after the injection of oil of turpentine an area of necrosis approximately 1 cm. in diameter was clearly visible. In the instance in which the temperature of the necrotic area and surrounding skin was maintained at 40° C. there was induration of the lesion and swelling of the surrounding skin at the end of three hours. At the end of twenty-four hours the amount of swelling was greatly increased and a zone of redness had appeared about the necrotic center. At the end of forty-eight hours the inflammatory process was fully developed in the surrounding skin, and the necrotic area was beginning to show definite evidence of disintegration by autolysis.

In the instance in which the temperature was maintained at 10° C. there was no gross change in the lesion or of the surrounding skin at the end of twenty-four hours and only a narrow red zone surrounded the area of necrosis at the end of forty-eight hours.

In the area kept at body temperature the inflammatory process was less than that in the heated wound but much more than that in the cooled wound.

In the area inoculated with the staphylococcus aureus and maintained at a temperature of 40° C. there was marked swelling, redness, and induration about the lesion at the end of twenty-four hours, and at the end of forty-eight hours there was a central area of necrosis, softening, ulceration, and a purulent discharge.

In the instance in which the temperature was maintained at 10° C. there was only a mild ecchymosis about the wound at the end of twenty-four hours which increased slightly by the end of forty-eight hours.

When the temperature was neither raised nor lowered the reaction was similar to that seen in the wound which was kept at 40° C. except that it was of lesser magnitude and intensity.

Cold applications were discontinued at the end of forty-eight hours and at the end of ninety-six hours the lesion which had been previously kept at 10° C. presented the same inflammatory picture as the lesion which had been kept at body temperature. Discontinuance of the hot applications was followed by a diminution in intensity of the surrounding erythema. Otherwise these lesions also presented the same picture as those which had been kept at body temperature.

These experiments suggest that it may be unwise to inhibit an inflammatory reaction by cold applications.

Excellent color photographs illustrate the inflammatory changes which are described.

EDWARD W. GIBBS, M.D.

Willits, R. E., and Hare, R.: The Mechanism of Cross Infection of Wounds in the Hospital by Hemolytic Streptococci. *Canadian M. Ass. J.*, 1941, 45: 479.

Hospital infection probably takes place by way of two main routes: (1) by direct contamination of clean wounds as with improperly sterilized instruments or the hands of the dresser, and (2) by the transport of infected particles by air currents. The details of this investigation were studied on 14 patients with various locations and types of infections. Cultures were made of the following sources of contamination as well as of the discharges from the wounds; various parts of the skin of the patients as well as of the upper respiratory passages of the patient, the bedclothes of the patient, and the air at various distances from the bed side. All cultures were taken by the wet-swab technique. Agglutinations of the streptococci were run against the sera of the same type as that obtained from the wound.

Hemolytic streptococci of the same type as those present in the wound were recovered from areas of the skin some distance from the wounds. In 8 of the patients similar organisms were also present in the nasopharynx. The fact that the incidence of skin contamination was higher in those with organisms in the nasopharynx indicates that this might have been the source of contamination rather than the wound. On the other hand, there was contamination of the skin some distance from the wound in 3 patients who were not nasopharyngeal carriers.

Bacteriological examinations of the bedclothes showed that the organisms (hemolytic streptococci) were most frequently recovered from the lower sheet and from the other bedclothes in the following order of frequency, bedspread, upper sheet, and pillow. Similar examinations of the outer covering of dressings showed that they were heavily contaminated with hemolytic streptococci. These results indicate that the organisms are not confined to the wound or its immediate vicinity, but may contaminate almost any part of the bed and its contents.

The transfer of infection by air currents was investigated in 10 patients, each of whom was the first case of that particular infection on the respective ward in months. It was, therefore, assumed that the great majority of the hemolytic streptococci isolated in this study had been derived from the wounds. This fact was checked by suitable agglutination studies. Studies of the table of the results show that in a great majority of the instances the streptococci recovered from the air were of the same type as were present in the wound. The numbers of streptococci isolated were smaller in numbers than were those reported by White, Cruickshank, and Miles *et al.* This disparity is explained by the facts that (1) the infection being studied in this series was the only one on the ward at the time; (2) the wards used were comparatively large which allowed for greater dilution of any polluting material; (3) the determinations were carried out during quiet periods of the day. It is, therefore, apparent that air pollution can and

does occur and this renders an infected wound a potential menace to any nearby clean wound.

The methods by which organisms reach the atmosphere were investigated by the use of a cardboard wind tunnel through which air was passed through infected dressings. At definite distances from the dressing and still within the tunnel petri dishes were placed so as to obtain samples of the air after it had passed through the dressing. It was observed that even in the face of having air passed through it at the rate of 50 feet per minute, a heavily infected dressing if allowed to hang quietly did not pollute the air to any extent. This was found as frequently in dry as in moist or wet dressings. However, only slight agitation of the dressing caused considerable pollution.

The possibility that pollution may occur as a result of expulsion of organisms from the nasopharynx must be kept constantly in mind. However, the fact that air contamination occurs in the vicinity of patients who are not carriers has been observed.

The skin of the patients is unlikely to be a source of air pollution.

That the contamination of the bedclothes may occur as a result of the air being first contaminated directly from the wound with a secondary settling out of the bedclothes is less likely than the possibility that air is polluted by movement of these objects. It was found that the air pollution was greater during the periods of activity on the wards than during quiet periods at night. It was also observed that the vigor with which the bed-making was performed did not seem to alter materially the degree of pollution of the air. This would indicate that the infected particles on the bedclothes are very light and any motion of the coverings would cause them to be released into the air.

The results of this investigation once more reemphasize the significance of many recognized sources of contamination for wounds, which have in late years been neglected. The authors believe that many of the infections of accidental wounds can be attributed to bacteria having come to them from one of these sources. Suggestions to minimize the danger of these sources are (1) a wing or ward to which all patients with any sign of infection can be transferred, (2) a special nursing and surgical staff to care for the infected case, (3) provision for the segregation and bacteriological control of all nasopharyngeal infections among patients and personnel. Other suggestions include the oiling of floors, the use of ultraviolet light, and other such measures.

ALFRED B. LONGACRE, M.D.

Callam, A., and Duff, A.: Wound Phagedena. Report of 2 Cases. *Brit. M. J.*, 1941, 2: 801.

The author presents 2 cases of spreading ulceration of the skin under the classification of wound phagedena.

On the eleventh postoperative day in the first case, following drainage for a ruptured appendix, the wound developed a carbuncular appearance. By the eighteenth day, three-quarters of the area of the abdomen, including the skin and the subcutaneous tissue, had become involved with complete disappearance of the skin and subcutaneous tissues. Surrounding this ulcerated area was a raised purplish margin. Culture studies of the wound revealed streptococci, gram-positive diplococci, and proteus bacilli. The streptococci were nonhemolytic and grew both aerobically and anaerobically. The patient succumbed to the infection on the twenty-first postoperative day.

Following an operation for empyema in 1933, in the second case, a discharge from the scar recurred annually. In 1939, the patient presented himself with a partially healed scar, at one end of which there was a granulating ulcer measuring about 2 in. in diameter. The edges of the ulcer were excised but the lesion continued to spread until it involved the back. This lesion had the appearance of an immense carbuncle with patches of purple skin riddled with discharging spots. In areas there was undermining of the skin. Aerobic cultures revealed the bacillus proteus and other organisms. Anaerobic culture revealed a free growth of nonhemolytic streptococci. A second culture revealed the nonhemolytic aerobic streptococci, a feeble growth of this organism appearing on the anaerobic plates. Zinc-peroxide therapy was instituted with some success. However, healing did not take place until after radical excision of the lesion had been done.

The main clinical features associated with this lesion are: (1) it occurs at any time from a few days to two weeks after an operation for an infective condition; (2) the active infection rapidly assumes the appearance of a carbuncle; (3) there is little general reaction; (4) there is an associated unremitting pain and secondary anemia; and (5) the condition may be acute or chronic, and the chronic lesions are characterized by a tendency to heal in one part while spreading in another.

The significant etiological organisms in these cases are the nonhemolytic streptococcus and the bacillus proteus. The possible symbiotic relationship between these organisms is discussed. It is believed by the authors that these organisms are probably present in the original lesion. The importance of adequate bacteriological studies of these lesions is stressed. These studies should include both aerobic and anaerobic investigations of the bacterial flora in the region of the spreading zone of the lesion.

In a discussion of infective skin gangrene the authors state that they believe many of the different reports, including those of Meleney, Mitchiner and Cowell, and Langston, describe similar conditions, all of which are closely allied to one of the varieties of "hospital gangrene." In view of this similarity they suggest that the term, wound phagedena, is a more suitable and concise term for any of these lesions.

Contrary to the reports of Meleney and Langston, zinc peroxide was ineffective in these cases. The authors recommend wide excision preferably with diathermy.

ALFRED B. LONGACRE, M.D.

ANESTHESIA

Latham, R. M.: Spinal Anesthesia with Crystalline Pontocaine Hydrochloride; 467 Consecutive Administrations. *Anes. & Anal.*, 1942, 21: 34.

The crystalline form of pontocaine hydrochloride is preferable to the solution because it is more stable and because the anesthesia produced is more readily controllable and causes less initial shock. It is also better tolerated.

The contraindications to its use are:

1. Surgery above the diaphragm
2. Advanced cardiac decompensation
3. Spinal-cord disease
4. Bone or skin infection at the site of injection
5. Children under fourteen years of age
6. Hypertension, moderate cardiac disease, anemia, severe shock, cachexia, uncontrolled diabetes, septicemia, and severe intra-abdominal pressure (borderline contraindications)

The complications encountered are:

1. Fall of blood pressure, with weak, rapidly rising pulse
2. Nausea and vomiting
3. Headache
4. Persistent severe hiccough
5. Muscular weakness
6. Urticaria
7. Epigastric and precordial pain
8. Pulmonary complications (the chief of which is pneumonia)

The use of crystalline pontocaine hydrochloride was found to be particularly advantageous in high abdominal surgery, in rectal surgery, in ventral and inguinal hernias, and in lesions of the urinary tract. Excellent results were obtained in over 88 per cent of 467 cases. SAMUEL KAHN, M.D.

Moyer, C. A.: Major Changes in the Fundamental Relationships of the Respiratory Drive Mechanisms During Evipal and Pentothal Anesthesias, with Special Consideration of Possible Applications to Transpleural Surgery. *J. Thoracic Surg.*, 1941, 11: 131.

The fundamental control mechanisms, including the vasopulmonary (Hering-Breuer) reflex, the respiratory muscle proprioceptors, and the vascular proprioceptors, through which respiratory function is initiated and continued in normal man and animal are carefully reviewed. A comparative study of the effects of some of the common general anesthetic agents upon the respiratory drive mechanism was made in dogs.

With 50 mgm. per kgm. of evipal in a 10 per cent aqueous solution, or 25 mgm. per kgm. of pentothal in a 5 per cent aqueous solution administered intravenously, it was found that these agents were capable of completely suppressing the central chemical drive of breathing while effecting relatively little depression of the reflex drives at a level of anesthesia too light for major surgery.

Opening of the pleural cavity immediately upset the balance between the center and the proprioceptive respiratory reflexes and interfered appreciably with the gas exchange in the lungs which resulted in oxygen lack and carbon-dioxide excess.

The author states that should animal or man be deeply anesthetized with evipal or pentothal to permit major surgery, the control of breathing and of the acid-base balance may be changed in an unpredictable manner. This risk is greater should the pleural cavity be opened, as this would permit the development of hypoxemia and hypercapnia, which accentuate the respiratory depressant action of these drugs.

The institution of the deflation vagopulmonary reflex by reduction of the size of the lungs made respiration an unreliable indication of anesthetic depth or the status of the respiratory center. Reinflation of the lungs or severance of the afferent pathway by blocking or cutting the vagus nerve may result in respiratory failure since there is no means of judging respiratory, circulatory, or reflex signs as to when the center's chemical drive is sufficiently reduced to cause the control of breathing to slip from the control of the center to that of the primitive drive mechanisms. Therefore the use of evipal and pentothal should be restricted in thoracic surgery.

Both anesthetic agents depressed the response to carbon-dioxide inhalations much more profoundly then they did the responses to low oxygen and changes of lung volume.

Respiratory failure was frequently induced by the administration of 100 per cent oxygen or the obliteration of the vagopulmonary drive by blocking the vagi during an anesthetic level at which the response to carbon dioxide was depressed. This was not observed at any stage of ether or cyclopropane anesthesia.

The author believes that respiratory failure during evipal or pentothal anesthesia should be treated by artificial respiration with a torsopressure method. When this is impossible he states that bag pressure must be used, with the bag only partially filled and all pressure must be removed from it between compressions. Not more than 40 per cent oxygen and 5 per cent carbon dioxide should be administered. The intravenous administration of from 2 to 4 minims of epinephrine is advised if the blood pressure is low before or during the artificial respiration.

The potentialities of the clinical application of this well conducted and fundamental study will have a far-reaching effect in both general and thoracic surgery.

This article was awarded the Rose Lampert Graff Prize. WILLIAM E. ADAMS, M.D.

SURGICAL INSTRUMENTS AND APPARATUS

Langston, H. T.: The Problem of Catgut Sensitivity and Its Relation to Wound Healing. *Ann. Surg.*, 1942, 115: 141.

Experience with thoracoplasty wounds closed with catgut reveals that healing is very frequently

poor. Although such wounds are probably the most abused of surgical incisions, this factor alone does not seem to be an adequate explanation for the disappointing results obtained.

Catgut was singled out for investigation as one responsible factor since the use of silk in each stage resulted in satisfactory healing.

The possibility of sensitization to the suture material was suggested because the instances of poor healing appeared to occur with regularity during the early stages. The later stages all healed kindly.

The commonly employed posterolateral thoracoplasty wound is one of the largest wounds surgically produced. The adverse factors affecting such a wound during healing are the thick muscles, the jutting ledge formed by the uppermost rib, excessive dead space, the poor blood supply left in the lateral flap of the incision, and the reopening of the wound each third week recurrently, which is probably the greatest single direct insult.

Mass closure of the muscle with mostly continuous catgut sutures and occasionally by the interrupted catgut technique cause the tissues usually to heal with obliteration of the areolar planes within 1 in. of the former incision. When silk is used in multilayered, small-bite technique, the tissues heal without obliteration of the fascial and muscular layers within three weeks.

An extract of catgut was made and skin sensitivity tests were performed on 54 patients admitted for thoracoplasty. The peak of sensitivity as estimated by the skin test occurred after two stages of thoracoplasty, or, in other words, after two exposures to catgut.

The intensity of the response to the skin test was carefully compared to the severity of the inflammatory reaction in the next stage wound, and a surprisingly accurate prediction of the appearance of the wound could be made on the basis of the preoperative skin test.

A typical reaction in the wound consisted of redness around the wound margin with subcutaneous wound edema and exuding serum, which began to subside about the seventh day and practically disappeared by the tenth day. Tests showed that in the presence of an hypersensitive response, lysis of the iodized, chromicized catgut occurred with greater rapidity (six to seven days) than in normal individuals.

When wound infections occurred, the infecting organism was the staphylococcus aureus or the bacillus tuberculosis.

Although it is difficult to weigh exactly the various reactions seen in wounds, the striking feature of these curves is the fact that the peak of incidence for all wound complications occurs in the third-stage wound, which also represents the inoculation of catgut immediately following the peak of sensitivity as demonstrated by the skin test.

JOHN E. KIRKPATRICK, M.D.

PHYSICOCHEMICAL METHODS IN SURGERY

ROENTGENOLOGY

Rees-Jones, G. F., and McGibbon, J. E. G.: Roentgenological Visualization of the Eustachian Tube. *Lancet*, 1941, 241: 660.

During the course of a clinical study of conduction deafness in aviators, an investigation was made in x-ray visualization of the eustachian tube by means of contrast media. In order to obtain satisfactory roentgenograms it is necessary to introduce into the eustachian tube a nonirritating opaque medium of low viscosity, and as far as possible to eliminate overlying bony shadows by positioning. The technique of introducing an opaque medium consists, briefly, of anesthetizing the nasal fossa, passing an eustachian catheter into the orifice of the tube, and then passing a tympanic catheter through this into the lumen of the tube. When the tympanic catheter is in proper position, its tip not more than 0.5 cm. in the tube, 10 minims of opaque solution are injected under moderate pressure. Iodized oils are unsatisfactory because of their high viscosity. A 10 per cent solution of sodium iodide was found to be irritating, and in 1 case its use was followed by acute otitis media. Pyelectan was found to be most satisfactory. The position of the skull and jaw for lateral visualization of the eustachian tube is shown in Figures 1a and b. The central ray passes through the angle of the mandible on the side opposite to that under examination. The relative position of the eustachian-tube shadow is shown in Figure 2.

The tube can be well visualized as far as the isthmus. The osseous portion of the tube could not be visualized in this series because in all patients an obstruction was demonstrated in the cartilaginous segment. The x-ray appearances have fallen into two distinct groups. With obstruction at the isthmus, the shadow had comparatively smooth edges tapering to a point at the cartilaginous and osseous junction. The most common obstruction occurred 1 or 2 cm. from the catheter tip, giving a "mushroom-like" shadow.

The results in 34 cases show that in aviation "pressure" deafness there is definite blockage in the cartilaginous portion of the eustachian tube. The extent or character of the obstruction was not ascertained. The authors believe they have disposed of the theory that a valvelike action of the pharyngeal orifice prevents the entrance of air into the tympanum. JOHN L. LINDQUIST, M.D.

Jones, H. C., and Hedrick, D. W.: Patellar Anomalies; a Roentgenological and Clinical Consideration. *Radiology*, 1942, 38: 30.

The history of patellar anomalies is briefly considered. A good classification is given as follows, and illustrated in Figure 1:

1. Emarginate patella with a conical or triangular projection at the upper and outer quadrant
2. Bipartite patella
   (a) Small fragment at the upper and outer quadrant (this is the most common type)
   (b) Vertical fissure, usually seen in the lateral quadrant
   (c) A doughnut patella, U-shaped with a small fragment between the arms of the "U."
   (d) Transverse fissure, seen usually at the lower pole
   (e) Linear-like fragment at the lower pole of the patella, which may be almost in contact with lower margin of the patella

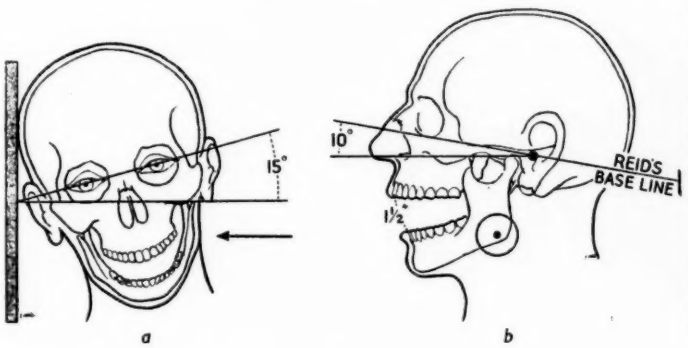

Fig. 1

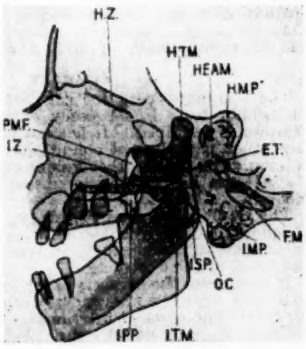

Fig. 2

Fig. 1. Positions of the skull for roentgenography of the eustachian tube.

Fig. 2. Relations of the shadow cast by the eustachian tube to the surrounding bony structures. H = heterolateral; I = ipsolateral; Z = zygomatic arch; T.M. = temporomandibular articulation; E.A.M. = external auditory meatus; M.P. = mastoid process; F.M. = foramen magnum; O.C. = basiocciput; S.P. = styloid process; P.P. = pterygoid plate; P.M.F. = pterygomaxillary fissure.

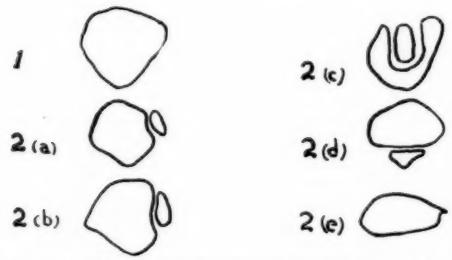

Fig. 1. Diagrammatic representation of patellar anomalies.

The differential diagnosis between patellar anomaly and fracture is often difficult. In anomaly the fragment is smooth and entirely bounded by cortical bone, but in fracture the outline of the fragment is serrated and only partially bounded by cortical bone. In anomaly the adjacent surfaces of the fragments are uniformly separated throughout the entire length but in fracture the space intervening between the fragments is of varying width. In anomaly the fissure is almost always in the outer and upper quadrant, a site at which fracture is seldom found. Anomalies are frequently bilateral, fractures usually unilateral. HAROLD C. OCHSNER, M.D.

Golding, F. C.: Tuberculosis of the Knee Joint. *Proc. Roy. Soc. Med.*, Lond., 1941, 34: 823.

One hundred cases of tuberculosis of the knee joint in patients from eleven months to seventy years of age were studied in an attempt to assess the relative importance and frequency of the features on which a roentgenological diagnosis is based, and also possibly to correct impressions of the value of certain signs which one accepts without question or without critical analysis. Most of the cases were followed for many years from the earliest evidence of disease to the final result.

The following features were chosen for analysis: (1) decalcification of the bone, (2) enlargement of the joint capsule, (3) the presence of abscess outside capsule, (4) enlargement of the epiphyses and patella, (5) narrowing of the joint space, (6) narrowing of the cortex of the shaft and widening of the medulla, (7) the presence of erosion on one-half of the condylar surface, (8) the presence of erosion on both condylar surfaces, (9) the presence of erosion on the articular surface of the patella, (10) coarse trabeculation of the ends of the bones, (11) posterior subluxation of the tibia, (12) genu valgum, (13) genu varum, (14) hyperextension, (15) the primary focus in the patella, (16) the presence of a clearly defined single focus in the epiphyses, (17) the presence of a clearly defined focus in the region of the metaphyses, (18) bone ankylosis as a result of conservative treatment, (19) bone ankylosis as a result of operative treatment, (20) recurrence after excision, (21) the presence of periostitis, (22) the presence of secondary infection (by sinus), (23) the evidence on the film of this secondary infection, and (24) sequestra.

The relative frequency of these features and special characteristics in connection with them are discussed at some length and numerous roentgenograms illustrating them are included. Local osteoporosis of the bones of the joint was an almost constant finding. Alteration in the cancellous structure over the whole of the osteoporotic zones was a most important feature of early tuberculosis. Enlargement of the epiphyses and patella and distention of the capsule of the joint were present in many instances. The commonly accepted opinions that bony ankylosis follows conservative treatment and that ankylosis is more prone to occur after secondary infection from a sinus were not confirmed by this series of cases. ADOLPH HARTUNG, M.D.

Fig. 1.

Fig. 2.

Fig. 3.

Fig. 4.

Figs. 1, 2, 3, and 4.—The patient was admitted in 1932. The history was of four months' duration. She was under treatment until August 1, 1941. She had then given up the caliper for three months. The films show a fairly typical example of the course of a tuberculous knee over a period of six years. They exemplify many of the features already described and some which follow in the subsequent paragraphs (A taken in 1932, B in 1934, C in 1936, and D in 1938).

Pendergrass, E. P., and Hodes, P. J.: Further Experiences with Chaoul Therapy. *Radiology*, 1941, 37: 550.

Since their previous report on the cases of 80 patients with various neoplastic and inflammatory conditions treated with short-distance low-voltage roentgen therapy, the authors have applied this method to many more lesions, and this communication is intended to record the results of their experience. The equipment used and physical data relating to the rays produced by it are given brief consideration. Attention is called to the need for protection of the operator during treatment of the patient. Advantages of the method include the possibility of delivering large quantities of radiation to superficial tissues without permanently injuring the tumor bed. The high output of radiation and the adaptability of application in some locations make this method an economical means for irradiation in suitable cases.

Conditions considered favorable for use of the method include skin lesions, lesions of the lips, eyes, anterior half of the tongue, anterior portions of the gingival margins, the floor of the mouth, and outer portions of the buccal mucosa. Lesions extending more than 1 cm. below the surface usually contraindicate its use. Extensive superficial lesions requiring more than five or six portals to cover them completely do not offer favorable conditions for its application. Cartilage does not seem to tolerate this form of therapy as well as higher energy irradiation.

As regards dosage and dose administration, conclusions drawn by the authors from their previous limited experience with the method still seem to be justified by the more extensive application of it. The total amount of irradiation depends almost entirely upon the reactions of the irradiated area. The treatment of small lesions which can be included in a single field is relatively easy. Dosages vary according to whether they are to be administered in a single massive application or fractionated. In rare instances supplemental treatments are indicated after an interval of several weeks. Lesions greater than 4 cm. in diameter must be treated through multiple portals which must be carefully chosen to insure uniform adequate irradiation. A lesion so treated will not tolerate as large a total dose as one treated through a single field. Cross-firing may be resorted to advantageously if the tumor is favorably located so that it can be applied as in carcinomas of the lip. Variations of technique to meet individual requirements are discussed at some length, as are also the different effects under those conditions. Untoward skin reactions in the form of indolent ulcers appeared in a few cases some time after the treatments.

The authors review 541 cases treated by them by this method during the past four and one-half years. These included 228 malignant tumors, 106 benign tumors, and 207 inflammatory conditions. Detailed consideration, including technique and results, is given to carcinomas of the skin, lip, and mouth; recurrent skin nodules of breast cancer; few miscellaneous malignant neoplasms, and such benign conditions as angiomas, keloids, warts, furuncles, vernal catarrh, pruritus ani, and rectal condylomas.

ADOLPH HARTUNG, M.D.

RADIUM

Fricke, R. E., and Bowing, H. H.: Further Studies in the Radium Treatment of Carcinoma of the Uterine Fundus. *Am. J. Roentgenol.*, 1941, 46: 683.

In carcinoma of the uterine fundus one is dealing with a low grade type of cancer with the best prognosis of any internal malignant lesion. The slow growth and late metastasis indicate surgical treatment for all good surgical risks. Less radical surgery is necessary than for cancers situated elsewhere.

Unfavorable features for the surgical treatment are that this type of cancer occurs in a late age group and many patients who have resectable lesions suffer also with serious unrelated diseases which greatly increase the surgical risk.

Radiation therapy is invaluable in increasing the five-year favorable results when used in conjunction with major surgical treatment and also as a palliative agent in extensive inoperable cancers. Fricke and Bowing employ tubes containing 50 mc. of radon, with brass and silver filtration, using two tubes in tandem in the intrauterine applications. The intrauterine applications start in the depth of the fundus and successive treatments irradiate the midfundal and the anterior fundal regions. The number of intrauterine applications depends on the length of the uterine canal. The cervical canal is irradiated also, and heavily filtered and well protected tubes are applied in the vaginal cavity. Thus, a patient with a moderately advanced lesion may receive 5,000 or 6,000 mc. hours of intrauterine treatment, around 1,400 mc. hours of treatment in the cervical canal, and 2,100 mc. hours in the vaginal cavity. The treatments are given two or three times a week for two or three weeks.

The course of radium treatment is followed by roentgen therapy around the pelvis, usually four fields in all, one area being treated a day. However, the radium in direct contact with the cancer provides the bulk of the treatment. The roentgen treatment is a valuable accessory but plays a secondary role.

Many techniques have been developed to improve the results of radium therapy, but Fricke and Bowing have never felt justified in changing from the repeated brass-tandem technique, as this implement seems the simplest to adapt to a varying cavity. The diseased uterine fundus is often irregular and the canal tortuous; the uterine walls may be friable and readily punctured. The main principle in applying treatment is the avoidance of trauma; to this end the patient is treated in the knee-chest position and the brass tandem on wire is inserted very gently at varying depths in the fundus.

Of patients who had carcinoma of the uterine fundus and who received radiation treatment alone at the Mayo Clinic from 1925 to 1935, inclusive, 39 per

cent were living five or more years after treatment and 16 per cent were living ten or more years after treatment. Serious complications occurred in 9 per cent of the cases. The hospital death rate was 2.6 per cent.

The stage and grade of the lesion are both important prognostic factors when irradiation alone is employed. Although low-grade lesions are considered radioresistant, in this series the lower grades had the best chance of cure.

Fricke and Bowing believe from this study that physicians have been too pessimistic about the cure of carcinoma of the fundus with radium alone; especially in small cancers of low grade. Carefully planned radiation treatment offers a good prognosis and, when the surgical risk is increased by poor general condition of the patient, much of the burden can be taken from the surgeon by the use of radium therapy.

MISCELLANEOUS

Marinelli, L. D., and Kenney, J. M.: The Absorption of Radiophosphorus in Irradiated and Nonirradiated Mice. *Radiology*, 1941, 37: 691.

In order to investigate the effect of roentgen radiation on the gross phosphorous metabolism of some animal tissues, the authors carried out certain experiments. They irradiated 84 mice on one leg, and immediately thereafter administered P^{32} intraperitoneally. Thirty-two mice retained as controls were given P^{32} at the same time. Members of both groups were sacrificed at varying times afterward and the P^{32} content of various tissues was assayed.

A comparison between P^{32} uptake in muscle and skin of the irradiated and non-irradiated legs of the same animal showed no significant difference. The P^{32} uptake in the bone of the irradiated leg was greater than the P^{32} uptake in the bone of the non-irradiated leg. A comparison between several non-irradiated tissues in the irradiated animals and the same tissues in the control group failed to show any significant difference in the P^{32} uptake.

The relative radiation dosage delivered by P^{32} to several tissues assayed was computed by determining the concentration of the isotope in these tissues as a function of time. It was found that the rate of elimination of the isotope by a tissue is an important factor in the radiation dose actually received by such tissue.

The essential data pertaining to the experiments are given in several tables and figures.

HENRY L. JAFFE, M.D.

MISCELLANEOUS

CLINICAL ENTITIES—GENERAL PHYSIOLOGICAL CONDITIONS

Lachmann, A.: Hypoparathyroidism in Denmark, a Clinical Study. *Acta med. Scand.*, 1941, Supp. 121.

This is a most valuable monograph consisting of a clinical study of postoperative as compared with idiopathic hypoparathyroidism. The case records of the 80 patients studied are included, together with an excellent bibliography of 348 titles. Statistical studies of the blood calcium levels before and after thyroidectomy are given. A careful clinical description of tetany is included. A search for patients with idiopathic hypoparathyroidism was made and 22 cases were found. In a discussion of the metabolic changes it is pointed out that deposition of tissue occurred occasionally, and reference is made to the very important cases of Eaton and Haines in which calcification in the brain—probably in the basal ganglia—was demonstrated. Epileptic attacks were noted in 3 cases. Apical dental deformities are illustrated and slit-lamp studies of cataract are discussed. Skin diseases are not common in hypoparathyroidism but may be serious when they do occur; of these the most common is impetigo herpetiformis. Two-thirds of the author's series of patients were less than twenty years of age. A valuable clinical classification of tetany is given.

As to treatment, dihydrotachysterol was found to be the only uniformly reliable medication and it was effective in practically all cases. It was possible to keep the serum calcium at a normal level and prevent the appearance of trophic complications. It must be remembered that in idiopathic hypoparathyroidism the discrepancy between tetanic symptoms and the serum-calcium concentration is even more pronounced than in postoperative hypoparathyroidism.

PAUL STARR, M.D.

Megibow, R. S., Katz, L. N., and Steinitz, F. S.: Dynamic Changes in Experimental Pulmonary Embolism. *Surgery*, 1942, 11: 19.

The effects of experimental pulmonary embolism were studied in a group of 14 dogs, following the insertion of the emboli into the right external jugular veins. Two of the dogs were used as controls. The dogs receiving small emboli were anesthetized with nembutal given intravenously to prevent the restlessness and excitement that follows the insertion of the emboli.

Three types of preparations were used, representing emboli of varying size, namely: (1) a Penrose tubing filled with fluid; (2) pea seeds; and (3) starch granules suspended in saline solution. A silver cannula had been applied around the pulmonary artery of each of the dogs one week prior to the experiments.

Following the death of each dog, an autopsy was done to determine the position of the embolus, and the effect on the vital organs. The experiments consisted of observations of (1) pulmonary arterial pressure; (2) systemic arterial pressure; (3) systemic venous pressure; (4) heart rate; (5) respiratory rate.

Tabulated records are presented of a representative experimental case in each of the three types of embolus. Also, the experimental results are given in 2 control dogs, 4 dogs with major pulmonary embolism (filled Penrose tubing), 4 dogs with multiple embolism of moderately sized arteries (pea seeds), and 4 dogs with multiple embolism of pulmonary arterioles and capillaries (starch granules). A constant finding in the experiments is the rise in systolic and diastolic pulmonary blood pressure. This rise varies with the degree of obstruction in the pulmonary arterial system. Although there is a decrease in the cardiac minute output, there is a relative stability of the systemic arterial pressure, which indicates that the buffer nerve mechanisms are efficient. Venous-pressure determinations were variable, being unchanged at times, rising frequently, and falling occasionally. This was due to the variation in the degree of obstruction causing the accumulation of blood in the venous system and, in turn, increasing the pressure, and the degree of diminished cardiac output decreasing the venous pressure. Heart-rate changes were inconstant. Rapid respiration developed as the pulmonary hypertension increased. Progressive cyanosis accompanied the respiratory changes. Occasionally, ventricular fibrillation appeared terminally. One primary mechanism was found to be operating in the cause of death of all the animals. This was dependent upon the mechanical obstruction by the embolus. There was rapid or slow failure of the right side of the heart, which depended on the degree of pulmonary embolic obstruction. The development of relative coronary insufficiency with myocardial ischemia was brought about by mechanical factors and not by reflex nervous mechanisms. "Reflex death" may possibly be accounted for only in those instances of death which were due to the development of ventricular fibrillation.

H. C. JERNIGAN, M.D.

Bruck, S., and Fruchter, J. M.: The Influence of a Single Dose of Commonly Used Laxatives on Gastrointestinal Motility. A Comparative Study. *Radiology*, 1942, 38: 145.

A study was made of the action of the following laxatives on gastrointestinal motility: cascara, licorice powder, magnesium citrate, magnesium sulfate, and castor oil.

Fifteen apparently healthy persons volunteered for this study. Each was examined with the usual water-barium meal, and the motility of the gastrointestinal was noted. Films were made immediately

after the ingestion of the meal and at intervals of one, three, four, six, eight, twenty-four, and forty-eight hours. The subjects were then divided into groups of 3 and each group was again examined within a week with a similar barium mixture, but this time one of the laxatives was given with the meal. In the case of cascara 2 drams of the fluid extract were administered in a water-barium mixture. The licorice powder was given in a dose of 1 oz., either immediately before, after, or mixed with 6 oz. of a water-barium mixture. Six ounces of magnesium citrate were administered immediately after a similar quantity of a barium-water mixture. The amount of the barium-water mixture given in the control study was also increased to 12 oz. instead of 8 oz. One-half ounce of magnesium sulfate was given immediately before the administration of the opaque meal. One ounce of castor oil was administered just before the water-barium mixture.

There was no alteration in the form of either increased or decreased gastric motility when a single dose of cascara or of licorice powder was given. Castor oil, magnesium citrate, and magnesium sulfate all produced delay in the gastric motility. With all of the laxatives, the proximal jejunum was apparently so irritated by the laxative that for the first one to three hours the quantity of barium retained was insufficient for good visualization. After that time its irritability was diminished and its motility approached normal. In the patients who were given magnesium sulfate there was definite delay in the passage of the meal through the small intestines; in the other 4, the motility of the small intestine was slightly increased.

When the meal reached the colon, there was hypermotility in all cases, but the end phenomenon differed considerably with different laxatives, although all of the patients had a definite diarrhea. After the administration of cascara the colon was almost empty at twenty-four hours and completely so at forty-eight hours. With licorice powder or castor oil there was much more complete evacuation of the colon, and much less retention at the end of both the twenty-four and forty-eight hour periods; this was true particularly with castor oil. With magnesium citrate, although bowel movements were numerous, the amount of actual retention at the end of forty-eight hours was the same as without the laxative. There was greater forty-eight-hour retention when magnesium sulfate was given than there had been in the same patients without the laxative.

HAROLD C. OCHSNER, M.D.

Jones, C. A.: A Clinical and Laboratory Study of Plasma Lipids in Obstructive Jaundice and Several Types of Hepatic Disease. *Am. J. Digest. Dis.*, 1942, 9: 1.

Biliary obstruction usually produces a hypercholesterolemia, accompanied by an increase in concentration of the other blood lipids. This increase may be prevented from occurring by concomitant liver damage due to chronic obstruction, intercurrent infection, hepatic toxins, or poor fat absorption.

In contrast to biliary obstruction, primary liver disease usually results in a diminished concentration of cholesterol and other lipids in the blood. This lipopenia apparently parallels the degree of hepatic damage.

Considerable difference of opinion exists as to the relative importance of free and esterified cholesterol in the hypercholesterolemia of obstructive jaundice. This lack of agreement is due to the fallacy of comparing the results of analyses of whole blood, serum, and plasma; the wide variance in preciseness of the methods used; the wide range of normal values; and the fact that certain physiological and pathological factors contribute in a nonspecific manner to the specific disease effect. A study of the plasma-lipids concentration in patients with liver diseases and obstructive jaundice was made with the idea of at least recognizing these various factors if control was impossible.

Studies were made of 26 normal individuals, 27 patients with hepatic disease (cirrhosis, carcinoma, hemolytic jaundice, toxic hepatitis, catarrhal jaundice), and 19 patients with obstructive jaundice (stones, carcinoma of the head of the pancreas, carcinoma of the hepatic ducts, stricture of the common duct) with the following results:

Although the concentration of plasma lipids in normal persons varies widely in health, the ratio of free to total cholesterol varies within very narrow limits. No significant difference between the concentration of plasma lipids in normal subjects and that in patients with hepatic diseases was found, but 25 of 27 patients showed an increased percentage of free cholesterol. These patients had other evidence of liver damage which roughly paralleled the degree of change of the free to total cholesterol ratio. Lipopenia was not found to be characteristic of this group of patients, but all who showed a marked lipopenia died. These patients also had anemia, fever, and failing nutrition. Low concentrations of total cholesterol were associated with low concentrations of plasma albumin, which together with other plasma proteins, were checked to rule out hemoconcentration.

Patients with obstructive jaundice showed a significant increase in the concentration of free cholesterol and an increased percentage of the free to the total cholesterol, but this offered no basis for a differential diagnosis from the group of patients with hepatic disease. Total and esterified cholesterol did not increase with the same degree of regularity as did the free cholesterol; low plasma albumin was not associated with low cholesterol concentration, and gross changes in the free to total cholesterol ratio in patients with obstructive jaundice did not always indicate a fatal termination as in the patients with hepatic disease.

Marked changes in the results of lipid determination were seen to occur in fever, anemia, and malnutrition, and it is suggested that malnutrition is

the most important factor in the production of lipopenic states in hepatic disease.

S. LLOYD TEITELMAN, M.D.

Sjövall, H.: A Case of Late Death Following Burns From Lightning (Ein Spaettodesfall nach Blitzschlag-Verbrennung). *Acta chir. Scand.*, 1941, 85: 455.

A man of seventy-six years, who was regulating the pitch of the blades of a windmill by means of pulling on the attached cords, found himself lying on the ground without being able to move a single muscle. The astronomical laboratory at Lund reported three thunderclaps about forty minutes before the patient was discovered, and since the patient himself estimates that he had been lying fully conscious for about fifteen minutes before he was discovered, it is assumed that he must have passed through a short period of the usual unconsciousness resulting from being struck by lightning.

When he entered the surgical clinic, about three hours later, his inner clothing was partly carbonized and noncharacteristically distributed burns of the skin were present, especially in the region of the right upper arm, shoulder, and axillary region, and from there they passed over to the region of the left pelvis and leg.

Excluding the general bodily numbing and loss of motion, considerable amounts of albumin in the urine, irregular heart action, weak pulse beats, and a lowered bodily temperature, the patient seemed to have suffered little damage from his experience. The convalescence also appeared to be rapid and without incident; the urinary albumin disappeared, as also the temporary periods of fever and vomiting, and the burns began to heal. Nevertheless, the cardiac irregularity persisted and on the thirteenth day following the accident, sudden death occurred.

Autopsy disclosed the typical findings of nephrosis; the heart appeared to be normal, but it was not examined microscopically. Nothing else of significance was uncovered.

The author inclines to the opinion that although the primary cause of death seems to have been circulatory—and this could well be an immediate result of the electric current—nevertheless there was in this case a deciding moment under the guise of the nephrosis, which can hardly be brought under the immediate effects of the current, and must be considered the secondary effect, perhaps of toxins, arising in the burned areas of the skin.

JOHN W. BRENNAN, M.D.

Kooistra, H. P.: Pilonidal Sinuses. A Review of the Literature and Report of 350 Cases. *Am. J. Surg.*, 1942, 55: 3.

The work of various investigators has shown quite conclusively that pilonidal sinuses are congenital lesions, although there are two schools of thought as to their exact origin. One maintains that pilonidal sinuses originate in a remnant of the medullary canal, and result from abnormal development of the neural canal; the other maintains that these lesions are due to an infolding of the surface epithelium, or a faulty coalescence of the cutaneous covering in early embryonic life. In an attempt to evaluate these theories, the author studied serial sections of 40 human embryos, and found evidence favoring them both.

In a study of 350 case records, covering a fourteen-year period, pilonidal sinus was found to occur about once in every 1,000 hospital admissions. The lesion is most commonly found in patients between twenty and twenty-five years of age, and males are affected more than females in a ratio of 3 to 1. Females develop symptoms earlier in life than males, possibly because of earlier puberty and resultant sex-hormone effect on body hair and secondary skin structures.

The disease is strikingly restricted to the Caucasian race. Family history inquiries reveal a hereditary factor in 10 per cent, which indicates an "anlage" for this defect early in embryonic development. Direct trauma plays a very minor role in the etiology of pilonidal sinuses, and the lesions are not to be seriously considered as foci of infection.

The outstanding symptoms are pain in the sacrococcygeal region and discharge. There is usually a history of recurrent abscesses in this region, and perhaps of previous operative procedures. The cardinal signs are abscess formation and the presence of one or more draining sinuses in the sacrococcygeal region. Most sinuses are midline, 2 cm. or more above the anus, with an epithelial lining; however, lateral sinuses often show a border of granulation tissue. The sinuses invariably run cephalad and communicate with the abscesses. A sinus rarely occurs at a higher level, and then commonly communicates with the spinal canal. Infection of such sinuses results in meningitis or a subdural abscess. Routine laboratory procedures are of little value, although roentgen examination following the injection of iodized oil into the sinus may be of value in complicated cases.

Diagnosis is usually not difficult. In the differential diagnosis, fistula-in-ano, furuncles and carbuncles, plugged sebaceous follicles, osteomyelitis, tuberculosis, syphilis, traumatic dermoids, implantation cysts, chordomas, teratomas, and fetal adenomas should be considered.

The pathological picture is that of a dermal sinus containing hair in about one-half of the cases, and evidence of acute or chronic inflammation in all of the cases.

Successful treatment must completely eradicate the cyst or sinus and all of the granulation tissue, and must control the infection during the process of healing. No single method of treatment has proved satisfactory. Ambulatory methods aim to destroy the diseased tissue either through the medium of chemicals (chloride of mercury, caustic silver nitrate, Carnoy's solution, fuming nitric acid) or by means of electrical currents. The great majority of surgeons favor hospitalization in the treatment of this

condition. Incision and drainage is the treatment of choice in cases showing acute infection, and excision is advised when the infection has subsided. Although a large group of men advise primary closure, the great majority prefer packing the wound, either with or without partial closure.

In this series, operative treatment was rendered in 202 of the 350 cases diagnosed. A general anesthetic was used in most patients. Incision and drainage was employed in 30 cases, and excision of the lesion in 169 cases. Three experiences with the injection of Carnoy's solution in cases having only incision and drainage gave encouraging results. Closure of the wound was limited to the more mildly infected cases, while the remainder were packed open, some with partial closure. Methylene blue solution used to delineate the lesion was effective. Elliptical incisions were used, and obliteration of all dead spaces was considered of the utmost importance in all wounds that were closed. It was usually necessary to expose the fascia over the sacrum and coccyx. Relief of postoperative discomfort was obtained by hot Sitz baths, bakes, and x-ray therapy.

Prolonged healing time and frequent recurrences leave much to be desired in the end-results of curative surgery for pilonidal sinuses. About three-fourths of the patients in this series reported a "permanent cure." The average healing time was fifty days. Nonabsorbable suture material was found much preferable to absorbable material, in cases in which partial or complete closure was attempted.

S. Lloyd Teitelman, M.D.

Rhoads, J. E., Fliegelman, M. T., and Panzer, L.: Delayed Wound Healing. *J. Am. M. Ass.*, 1942, 118: 21.

The authors studied the mechanism of delayed wound healing in the presence of hypoproteinemia. The latter is known to prevent normal fibroplasia (in the dog). The source of the protein necessary for fibroplasia is not definitely known. It may be derived from dietary protein, from stores of labile protein, or from fixed body proteins or their catabolism.

The authors' experimental work consisted of studies on hypoproteinemic dogs in which it was possible to restore the osmotic properties of the plasma, without contributing to the protein intake, by the administration of acacia. On the basis of this work it was evident that the formation of fibroblasts is not a function of the concentration of the serum proteins. The following hypotheses were suggested in explanation of the effect of the acacia:

1. The relation of hypoproteinemia to wound healing is mainly on an osmotic basis. The acacia corrects the low colloid osmotic pressure of the serum, with the result that fibroplasia occurs.

2. The relation of hypoproteinemia to wound healing is mainly on a nutritional basis, but the administration of acacia makes it possible for more brotein to be withdrawn from the plasma for tissue-puilding purposes.

It is not possible at present to decide which of these hypotheses is correct or whether both are important. The authors conclude that fibroplasia occurs in the hypoproteinemic animal if ample amounts of acacia are given intravenously to maintain the colloid osmotic pressure of the plasma. This occurs even if chronic hypoproteinemia is produced so as to deplete the stores of labile proteins. Failure of fibroplasia in these animals is not directly a function of the concentration of the serum proteins. Acacia solution is not recommended in the treatment of hypoproteinemia in patients.

Jacob M. Mora, M.D.

Morris, H. P., and Lippincott, S. W.: The Effect of Pantothenic Acid on Growth and Maintenance of Life in Mice of the C3H Strain. *J. Nat. Cancer Inst.*, 1941, 2: 29.

Pantothenic acid is a growth factor essential for yeast and has been synthetically produced. It has been proved to be an essential growth factor for many laboratory animals. The use of the mouse is especially indicated in order to investigate later the effect of pantothenic acid on the growth of spontaneous mammary carcinoma. The disadvantages of using the mouse are enumerated and contrasted with the benefits, chief of which is the economic consideration of smaller food intake.

The use of synthetic diets allows more precise experiments on the relationship of dietary constituents to normal and tumor growth. The basal diet consisted of vitamin-free casein (18 per cent), sucrose (53 per cent), salt mixture, (6.0 per cent), crisco (20 per cent), corn oil (1 per cent), codliver oil (1 per cent), and wheat germ oil (1 per cent).

The first experiment consisted in feeding young normal mice on such a diet and after a fall in weight was noted supplementation was made with a mixture of 40 gamma of thiamine, 20 gamma of riboflavine, 20 gamma of pyridine hydrochloride, 1 mgm. of choline hydrochloride, and 1 mgm. of nicotinic acid per mouse per day. This addition induced a slight gain in weight followed soon by a second fall. At this point 40 gamma of synthetic pantothenic acid was added to the supplement and an immediate response was secured and the normal expected weight was nearly attained. A new synthetic diet was then made containing all of the vitamins except pantothenic acid. When adult mice were given this new diet a prompt loss in body weight occurred, along with a severe dermatosis and a definite paralysis of the posterior portion of the body. The onset of loss of body weight began one week after the diet was started. When the animals were *in extremis* one-half were sacrificed and the other half given 0.2 cc. daily of an aqueous solution of 500 gamma per cc. of synthetic dextrorotatory calcium pantothenate. The response to this was a rapid recovery to normal weight. This study indicates that there is no appreciable storage of pantothenic acid.

Quantitative experiments were then designed and it was found that from 23 to 29 gamma of panto-

thenic acid were above the minimum requirement since there was no indication of growth retardation at that dosage level. The material was absorbed well from the alimentary tract.

Associated with the weight loss in the animals on deficient diets was denudation of hair on the ventral surface, flanks, and hind legs. The same areas also were subject to dermatosis. Ten days after pantothenic-acid therapy was started the hair and skin improved and eventually returned to normal. There was also a partial paralysis of the hind legs with a characteristic dragging gait and squatting position. The histological changes, reported elsewhere, show myelin degeneration in the cord and posterior roots.

Since adequate amounts of thiamine were given, the myelin degeneration was not produced by its deficiency. Adrenal necrosis reported in rats under similar conditions was not noted, and it is probable that the shorter survival period of mice may not allow time for this to take place. There may be a species difference. Other differences between the findings in rats and mice are discussed, but other reported studies were made with diets which probably contained impurities.

HENRY P. ROYSTER, M.D.

Lippincott, S. W., and Morris, H. P.: Morphological Changes Associated with Pantothenic-Acid Deficiency in the Mouse. *J. Nat. Cancer Inst.*, 1941, 2: 39.

Morphological changes associated with pantothenic-acid deficiency have never before been reported in the mouse although several studies have been made on the rat. The recorded findings in the latter were hemorrhagic rhinitis, spectacled eyes, nutritional achromotrichia, cartilage hyperplasia, abnormal thymic involution, paralysis, and adrenal hemorrhagic necrosis. Mice did not develop adrenal change.

A control group of 20 animals received a complete basal diet supplemented with synthetic vitamins. The experimental group consisted of 43 animals fed on the same diet and vitamins, save that no pantothenic acid was incorporated. The experimental group was divided into both young and adult animals. The control group maintained their weight and were normal throughout the six months of the experiment. In the experimental group pantothenic acid was found to be necessary for growth in the young and also for life in both young and old. Also, the hair became thin about the nose, scapulae, flanks and lower abdomen. The skin scaled in the same regions and was thickened and encrusted about the nose. The animals squatted and dragged their hind quarters and the gait was awkward.

A wide variety of histological studies was performed on many portions of the body. There was no abnormal change in the adrenal glands. The bone marrow showed no changes although there was a change previously reported in rats. There was occasional occurrence of fat in the heart, liver, and kidney. Degenerative lesions appeared in the skin, with hyperkeratosis, flattening, and occasional disappearance of the malpighian layer of the epidermis. In the absence of overlying hyperkeratosis atrophy of the epithelium did not occur. Areas of erosion presented bases of corium. The entire process appeared to be a hyperkeratotic, atrophic, and desquamative dermatosis.

In adults only did myelin degeneration of nerve sheaths occur (sciatic in this study); in young animals myelinated fibers were not frequently seen. Numerous areas of degeneration were seen in the posterior funiculus, pyramidal tracts, and posterior roots. These lesions of the nervous system are to be considered more as demonstrable expressions of the general disturbance in tissue metabolism.

This basic alteration in metabolism is attested by the inability of the animals to survive in the complete absence of pantothenic acid in the diet. Therefore, the deficiency affects all of the tissues from a biochemical point of view, but only a few tissues give morphological indication that lesions are present.

HENRY P. ROYSTER, M.D.

Morris, H. P., and Lippincott, S. W.: The Effect of Pantothenic Acid on Growth of the Spontaneous Mammary Carcinoma in Female C3H Mice. *J. Nat. Cancer Inst.*, 1941, 2: 47.

Animals with spontaneous tumor development lend themselves favorably to nutritional experiments. The growth of a spontaneous tumor bears a relationship to the metabolism of the host and anything affecting the latter may affect the tumor. Other experiments in nutrition affecting spontaneous mammary carcinoma in mice are reported with the use of certain amino-acids. Caloric intake *per se* may also restrict tumor growth. Pantothenic acid is essential for body growth and it may have a significant function in tumor metabolism.

In the present investigations the standard rate of tumor growth was first established and compared with that of animals on a similar diet except for the addition of pantothenic acid. All tumors were biopsied both at the beginning and at the end of the experiment. Fifty-five animals were used. There was no microscopic change in the tumors. The tumors were measured in two diameters and when more than one tumor was present on a single animal both were counted. New tumors arising during the experiment were not included. One group of animals was placed on a complete synthetic diet, and two groups on a diet complete except for lack of pantothenic acid. After five weeks one of the latter two groups was given daily 100 gamma of calcium pantothenate in a volume of 0.2 cc. by a stomach tube. A growth-rate curve was established in the control group, and in those deficient in pantothenic acid the rate was much less rapid. When pantothenic acid was administered there was marked stimulation of the growth rate, which after one week was the same as the control.

Concomitantly, there was a decrease in body weight in those not receiving pantothenic acid even

though equivalent amounts of food were consumed per unit of weight. Therefore, there was no caloric deficiency.

The authors conclude that the normal and tumor tissues need pantothenic acid in their metabolism although qualitatively the amount may not be the same. Retardation of tumor growth by pantothenic acid-deficient diets results simultaneously in such interference in the host's nutrition that the procedure offers no practical application in adjunct tumor therapy. HENRY P. ROYSTER, M.D.

Beaton, L. E., and Davis, L.: Glomus Tumor. A Report of 3 Cases; Analysis of 271 Recorded Cases. *Quart. Bull. Northwestern Univ. Med. School*, 1941, 15: 245.

The existence of a remarkable type of arteriovenous anastomosis, the subcutaneous neuromyoarterial glomus, has been recognized since the latter half of the nineteenth century.

The authors have been able to collect 271 recorded cases of glomus tumor, including the 3 of their own. The glomus tumor is generally a single tumor. Of the cases assembled by the authors only 14 (a little over 5 per cent) were multiple. Ten of these were in men, 4 in women. It has been stated that glomus tumors are more common in females than males, yet in the present series the incidence in each sex was the same. The ages of the subjects at the time of operation were given for 237 of the compiled cases and averaged forty-three and four tenths years. In women the nail-beds and tips of the fingers were overwhelmingly the sites of preference, while in men the forearms, knee region, and the arms and legs were more often affected. Of 112 tumors in males, only 16 (14.3 per cent) were on the fingers, while of 116 in females, 86 (74 per cent) were so located. This raises a question as to a possible sex difference in the distribution of normal glomera. The predominant left-sidedness, especially of tumors on the hands, and the sex differences in location do not fit well with any theory of traumatic causation.

The tumor is an exaggeration of the structure of the normal glomus, with an overgrowth of all the three principal elements of the latter—vascular spaces, epithelioid cells, and nerve fibers.

Clinically the glomus tumor presents pathognomonic signs and symptoms, and in most cases diagnosis is not difficult. There is usually a small, bluish tumor, located subcutaneously or subungually. The cardinal symptom is exquisite tenderness to touch or jarring, which produces pain that often radiates diffusely and sometimes long distances. Pain on exposure to cold is frequently exhibited, although some patients paradoxically react thus to heat; in either case pain on rapid external temperature alteration is characteristic. Pain in the tumor can be caused by applying a blood-pressure cuff to the arm and raising the sphygmomanometric pressure to the diastolic level. On the contrary, if the arm be elevated and the pressure quickly raised to the systolic level, pain can be relieved. Increased sweating over the tumor site or of the whole hand or extremity is a frequent but not constant sign. The temperature of an affected hand has often been found to be higher than that of its normal mate.

Glomal tumor is benign, and its total removal results in a cure that is usually dramatically immediate, although in long-standing cases the area of radiation of the former pain may remain noticeable for several months. JOSEPH K. NARAT, M.D.

Blum, H. F., Kirby-Smith, J. S., and Grady, H. G.: Quantitative Induction of Tumors in Mice with Ultraviolet Radiation. *J. Nat. Cancer Inst.*, 1941, 2: 259.

So many investigators have produced neoplasms with ultraviolet radiation that there can be no question of the efficacy of this agent in carcinogenesis. Only few, however, have made quantitative estimates of the incident radiation required.

The method described by the authors has been developed to meet the need for reproducible quantitative measurements.

While it would be desirable to expose the animals to monochromatic radiation, this is not feasible because of the difficulty of obtaining monochromatic radiation of the required intensity over an area as large as a single mouse, let alone the numbers required for statistical treatment.

The mercury arc, which serves as a source of ultraviolet radiation, is mounted in a metal housing equipped with a semiparabolic aluminum reflector. The animals to be irradiated are placed upon a slowly revolving turntable. The entire apparatus is mounted in a metal cabinet equipped with forced ventilation in order to remove noxious gases produced by the lamp, and to prevent a rise in temperature. The instrument for radiant-energy measurement is an integrating titanium photoelectric meter developed by Kuper, Brackett, and Eicher.

One hundred per cent incidence of tumors of the ears of male Strain A mice may be induced by radiation such as used by the authors.

At higher dosages of radiation the time for appearance of the tumor is little affected by the dosage, but at lower dosage this time increases markedly with decreasing dosage. JOSEPH K. NARAT, M.D.

Grady, H. G., Blum, H. F., and Kirby-Smith, J. S.: Pathology of Tumors of the External Ear in Mice Induced by Ultraviolet Radiation. *J. Nat. Cancer Inst.*, 1941, 2: 269.

This article deals with the gross and histological features of tumors of the external ear induced in male mice by ultraviolet radiation. Tumors of the external ear have been adopted as the basis for incidence studies since in 144 of a total of 147 tumor-bearing mice the external ear was involved. When a tumor appeared on the external ear the animal was killed by cervical dislocation, and both ears and cervical lymph nodes were immediately placed in

Zenker's fluid containing 5 per cent of acetic acid. Histological examination of the ears and cervical nodes was made in every instance, and any other lesions observed at autopsy were also examined histologically.

The animals were examined twice weekly during the course of treatment, and the gross diagnosis of tumor was made, with very few exceptions, by the same observer, so that the criteria for selection were as uniform as the nature of the material permitted.

The predominant type of tumor observed was a fibrosarcoma. Less frequently, combinations of fibrosarcoma and squamous carcinoma occurred. There were only 3 instances of squamous carcinoma alone.

The preponderance of sarcomas in these experiments is striking, particularly in view of the results of previous investigators.

The bearing of studies such as these on the importance of sunlight as an exciting agent in human cutaneous cancer is of particular interest. The difference in the distribution of tumor types in the 2 cases was most striking, sarcomatous growths predominating in the case of mice, whereas the vast majority of malignant tumors of the human skin are carcinomas. This discrepancy may be explained, in part at least, by the difference in penetration of the tumor-producing radiation (wave lengths shorter than 3200A) into the skin in the 2 cases. Direct measurements in the authors' laboratory show that human epidermis absorbs virtually all such radiation, so that the direct effects are limited to the epidermis; hence it would be expected that only carcinomas would be produced. On the other hand, a great part of such radiation penetrates to the dermis of the mouse, so that it is not surprising that sarcomas result. The epidermis, of course, also absorbs a certain proportion of the radiation, so that carcinomas as well as sarcomas are to be expected.

Thus, to account for the high proportion of sarcomas in proportion to carcinomas, it may be necessary to assume that the connective tissue of the dermis is more susceptible to the production of tumors by this agent, or, alternatively, that the sarcomas develop earlier than carcinomas. If the latter is true, the early selection of the tumors practiced in the present studies would favor the finding of a higher proportion of sarcomas.

JOSEPH K. NARAT, M.D.

Nelson, A. A., Fitzhugh, O. G., Morris, H. J., and Calvery, H. O.: Neurofibromas of Rat Ears Produced by Prolonged Feeding of Crude Ergot. *Cancer Research*, 1942, 2: 11.

During the course of an experiment to determine the chronic, toxic effects of crude ergot when fed to albino rats of Osborne-Mendel strain, the authors noted the development of tumors on the ears of animals fed with a 5 per cent dosage in 23 of 38 cases, and in 9 of 38 animals fed with a 2 per cent dosage. The tumors appeared only on the ears and were more numerous peripherally.

They were multiple, rounded, circumscribed (but not encapsulated) moderately firm subcutaneous masses up to 8 mm. in diameter.

The cut section was pink-white in color and of a pearly luster. Microscopically the tumors were characteristic of neurofibromas. They were made up of from oval to spindle-shaped cells, often arranged in whorls and fairly often in palisade formation. Small nerves were seen frequently.

The tumors were not truly malignant. They did not metastasize and regressed rapidly when feeding of the drug was stopped. When the feeding was resumed they again grew and regained their former size within two or three months.

No definite conclusions were drawn by the authors concerning the tumor development, and the fraction of the crude ergot responsible for the phenomenon was not determined.

Photographs of representative animals and photo micrographs of the tumor tissue were presented.

ROBERT D. MANSFIELD, M.D.

Campbell, D. A.: Carcinoma of the Upper Extremity. *Arch. Surg.*, 1941, 43: 803.

Less than 10 per cent of all cutaneous lesions diagnosed as carcinoma occur in the upper extremity (Mason). The etiological factors (Adair) are: (1) changes of old age (keratoses); (2) exposure to the elements; (3) previous burns; (4) internal medication (arsenical dermatitis); (5) prolonged chemical irritation; and (6) roentgen or radium irradiation of the skin. Lupus vulgaris undergoes malignant changes in 3.2 per cent of all instances of this disease (Mundelein).

At the University Hospital (Michigan) 36 patients with carcinoma of the upper extremity were studied. Four of these were women. The average age of all was sixty-one and six-tenths years. The dorsum of the hand was involved in 23; the fingers and thumb in 7, the wrist in 3, and the forearm in 3. At the first examination 16 had palpable epitrochlear or axillary nodes and 8 of these suffered recurrence or ultimately died of carcinoma.

Surgical treatment consisted of local excision without grafting (3); local excision with grafting (10); amputation of the finger (4); and amputation of the arm (2). In this group there was 1 recurrence in a patient treated by local excision without a graft. Caustic or fractionated doses of roentgen irradiation were used in treating the local lesion in 8 cases (radium was used in 1). In 4 of these there later was recurrence of the disease. In 9 patients severe or widespread metastases were present, which required a variety of treatments of the local and distal disease. All but 1 patient were dead at the time of the report.

Four patients lived five years without recurrence; 8 died of other causes without recurrence, and fourteen showed no evidence of recurrence but the duration since treatment is too early to warrant any conclusion. In 18 cases other proved unrelated neoplasms were present. Fourteen of these occurred on

the face and 4 on other extremities. The microscopic examination showed 34 to be of the squamous-cell type; 1 was mediocellular and 1 was an adenocarcinoma of sweat-gland origin.

The average age of the patients dying from cancer was fifty-two and seven tenths years, whereas the average age of those dying from intercurrent disease was seventy-five years. Vigorous early treatment must be carried out if a good outcome is to be expected. Wide surgical excision of the local lesion and a combination of surgical procedure and roentgen irradiation of the regional nodes have yielded the best results.

MANUEL E. LICHTENSTEIN, M.D.

GENERAL BACTERIAL, PROTOZOAN, AND PARASITIC INFECTIONS

McSwain, B., and Glenn, F.: Sulfadiazine in Experimental Streptococcic Infection; A Study of the Effects of Local Implantation. *Arch. Surg.*, 1942, 44: 231.

Sodium sulfadiazine (0.4 gm. per kgm. of body weight) given subcutaneously to rabbits every four hours failed to produce a consistent blood-level concentration of the blood. Yet this amount of the drug so administered was bactericidal for the beta hemolytic streptococcus in the blood. In 12 control rabbits with wounds inoculated with a lethal amount of a culture of the beta hemolytic streptococcus of known virulence the average survival period was thirty-two hours and all but 1 had positive blood cultures. When sodium sulfadiazine was given to a series of 24 animals with similarly inoculated wounds, 5 (20.8 per cent) survived, and their blood became sterile. Sodium sulfadiazine (0.4 gm. per kgm. of body weight) given subcutaneously did not result in sterilization of the wounds containing devitalized muscle or devitalized muscle plus a foreign body (cotton). This apparent lack of effect suggests the advisability of placing the drug directly in the wound. WALTER H. NADLER, M.D.

DUCTLESS GLANDS

Brody, E. B.: The Influence of Thyroidectomy on the Variability of Neuromuscular Activity in the Rat. *Endocrinology*, 1941, 29: 916.

The decreased activity following thyroidectomy may be attributed in part to the lowered levels of excitation of the nervous system. Experiments to study the effect on neuromuscular activity of thyroidectomy in male albino rats were performed. Using the revolving drum technique to measure the levels of activity, normal levels were determined for 16 rats. The observations of the hypothyroid animals were made sixty days following thyroidectomy. As a check the influence of hyperthyroidism was studied in 15 male and 12 female rats. Hyperthyroidism was induced by injecting subcutaneously D-1 thyroxin at the isoelectric point.

The results indicated that there is a definite decrease in activity following the elevation of the metabolism by the injection of D-1 thyroxin. This reduction was not proportional to the increase in metabolic rate in that doses of thyroxin which were not sufficient to increase significantly the metabolic rate resulted in a marked reduction in the level of activity.

Fifteen of the 16 thyroidectomized rats showed a significant reduction in day to day activity. It was also observed that in individual animals there was a significantly smaller variation following thyroidectomy than under normal conditions. This is interpreted to indicate that the thyroid secretion is probably one of the major factors of individual differences occurring in activity levels.

ALFRED B. LONGACRE, M.D.